The contributions of selected personality and situational variables to variations in teachers' attitudes to curriculum innovation

Thesis

The contributions of selected PERSONALITY and SITUATIONAL variables to variations in teachers' attitudes to curriculum innovation

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A thesis submitted for the degree of Doctor of Philosophy (Education) of the Open University

June 1978

Date of submission: 15-6-78
Date of award: 1-12-78

VOLUME ONE

ABSTRACT OF THE STUDY

The aim of the research was to estimate the contributions of selected PERSONALITY and SITUATIONAL variables to variations in teachers' attitudes to curriculum innovation.

A TWO-STAGE approach was adopted. At STAGE A, reliable measures of teachers' attitudes were developed by factor analysing the responses of 80 Polytechnic teachers to an innovation in the Engineering Drawing curriculum for Technician students in TAMIL NADU (a state of South India). The contributions (partial correlations squared) of Dogmatism (a PERSONALITY variable) and of SITUATIONAL variables to variations in those teachers' attitudes were determined by Multiple Correlation Analysis. A similar correlation analysis was done in a group of 134 teachers made up of 54 teachers from three other States of South India (where the innovation was not implemented) together with the 80 teachers from TAMIL NADU.

A "quasi-illuminative" study of the innovation was also undertaken. This included on-site observations of teacher classroom behaviours and a study of Pass Rates in Engineering Drawing examinations before and after the innovation.

STAGE B consisted firstly in replicating (by "second-order comparison") the correlational study in a sample of 82 Secondary School teachers concerned with a New Mathematics curriculum in England. Secondly, the list of independent variables for the correlation analysis was extended to include two RESISTIVITY FACTORS which were derived by factor analysis from four personality variables (Dogmatism, Rigidity, Neuroticism and Extraversion).

Overall, the results indicated that there was a significant, negative correlation between RESISTANCE-within-PERSONALITY (mainly in the form of Dogmatism) and teachers' attitudes to curriculum innovation. Less clear-cut was the relationship between these attitudes and the teachers' "KNOWLEDGE" of curriculum innovation. However, Attendance on Courses of specific training for implementing innovation explained some of the variance in the teachers' attitudes and suggestions were made for the organization of such courses.

ACKNOWLEDGEMENTS

I would like to express my deep gratitude to the following for the direction they gave to my studies and for their continuing advice and encouragement:

Dr J Bynner, Faculty of Educational Studies, the Open University

Professor A Smithers, Department of Education, University of Manchester.

I wish to thank the following officials of the Polytechnic, Huddersfield, for giving me some time off teaching in order to complete my thesis:

Mr K Durrands, Rector

Messrs F Barr and T Gaskell, Pro-Rectors

Messrs B Grant and J Flinn, Heads of Departments, (Faculty of Education).

I should also like to record my sincere thanks to the following people for making my research possible:

Mr A MacLennan, Director of the former Huddersfield College of Education (Technical)

Messrs G Hunting and J Davies, Officers of the Technical Education and Training Organization (TETOC), London

Professor A Jambulingam, Principal, the Technical Teachers' Training Institute (TTTI), Madras, and his staff

The Directors of Technical Education in the States of Tamil Nadu, Mysore, Kerala and Andhra Pradesh (South India).

A number of people have troubled themselves on my behalf and in the furtherance of this thesis. I wish to place on record my thanks to all of them and in particular to (a) the teachers in India and in England who co-operated so fully in my research and (b) the staff of the Department of Computer Studies and Mathematics, Huddersfield Polytechnic, who helped with the data processing. I acknowledge gratefully too the assistance of Mrs A Muscroft in typing the initial drafts and of Mrs A Middleton and her staff in typing the final version of this study.

Lastly, my wife and family at home have been very patient indeed with me and I owe a great deal to them.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND TO THE STUDY

This study arose from our secondment to the Technical Teachers Training Institute (TTTI), Madras, in 1973. We were then assigned the task of studying the reactions of Engineering Drawing teachers in the Polytechnics of TAMIL NADU (a state of SOUTH INDIA) to a curriculum innovation in Engineering Drawing for Technician students.

Details of the innovation, such as we were able to obtain, are given in Appendix A. Briefly, however, we were given to understand that the fourth Five-Year Plan for Technical Education in India (that is, for 1970 to 1975) had included "schemes" for improving the quality and standards of Technical Education. One of these "schemes" included Curriculum Development Programmes for Engineering courses at the Technician level. Accordingly, in 1970 curriculum groups were set up in each of the four Technical Teachers Training Institutes in India and also in one Polytechnic. The expenditure for these "curriculum centres", as they were called, was paid by the Ministry of Education (Government of India) out of the provision for what was described as "Quality Improvement Programme". At the TTTI, Madras, a Curriculum Development Unit started functioning in 1971. To begin with, the Unit was run by TTTI staff drawn from the departments of Mechanical Engineering and of Education, respectively; however, two experienced Polytechnic teachers also joined the team and a Professor was later appointed to take charge of the Unit. An Advisory Committee was set up to advise the Director of Technical Education in TAMIL NADU about innovations in the curriculum for Technician Education.

The TTTI, Industry and the Polytechnics were all represented on that Committee. By early 1972 the Unit had completed most of the necessary work on the preparation of new curriculum materials for a new syllabus for the introductory course in Engineering Drawing. These materials were in the form of Teachers' Support Materials and of Students' Support Materials. All the Polytechnics in TAMIL NADU were informed by the state Director of Technical Education (whose office was in Madras) that these new materials were to be implemented in the Polytechnics in the next academic year (that is, from July 1972 to April 1973). All the Polytechnics were requested to purchase the required number of copies of the materials from TTTI and were also informed that model examination papers were to be supplied to them as well. Thus, an important aspect of this particular curriculum innovation was that it was imposed on the Polytechnics of TAMIL NADU by the Director of Technical Education. The same was not true of the three other states of SOUTH INDIA (Mysore, Kerala and Andhra Pradesh); the innovation was not officially adopted in these states.

A few months later in 1972 the TTTI in Madras realised that the Polytechnic teachers in TAMIL NADU were to be "at the centre" of the "improvement"that was to take place in Polytechnic education. They wanted a research project to be undertaken in order to find out the reactions of teachers to the innovation in the Engineering Drawing curriculum. They requested help for that purpose from the British Government and it was in response to this request that we were seconded to the TTTI, Madras, on two occasions over a period of six months (see Appendix C). As we understood it, the request from the TTTI was straightforward. The immediate need was to obtain feedback about the innovation from the teachers after one year of implementing it (the innovation). Such feedback was required in order to help the Curriculum Development Unit to modify their Support Materials as necessary. However, we ourselves saw in the research project a problem of fundamental importance and took the opportunity to study it as we describe in the next section below.

1.2 STATEMENT OF THE PROBLEM

The problem was to try and account for the variations in teachers' attitudes to curriculum innovation when such an innovation was implemented in a "formal organization" (Blau, 1957). By its very nature, a formal organization was characterized by an authority structure and by a formally established system of rules and regulations which governed the behaviour of its members. When, therefore, in "formal organizations" like the Polytechnics of TAMIL NADU, the decision to implement curriculum innovation was forced upon teachers by someone in a superordinate power position (The Director of Technical Education through the Principals) and the overt behaviour of the teachers was manipulated by the organization, the question was, what were the factors that contributed to variations in the teachers' attitudes to the curriculum innovation?

Lin (1966, b) has made the point that the usual diffusion studies of innovations investigated adoption rates which were defined operationally in terms of the time taken for an innovation to be adopted behaviourally, but that behavioural change did not necessarily imply attitudinal change, and that this discrepancy implied that the two variables needed to be investigated separately in studies of innovations. It seemed to us that since in the case of curriculum innovation in a "formal organization" the adoption (behaviour-wise) of the innovation by the teachers was a variable under control, the appropriate variable for study was the attitude of teachers to the innovation.

When we took a theoretical view of the problem, we realised that it could be considered within the broad outline of the stimulus-response paradigm whereby a person's response in a given situation was a function of his personality and of the stimulus situation itself (Cattell, 1950, 1965; Ryans, 1960). The basic assumption which was therefore made in the present study could be summarized in the proposition that teachers' attitudes to curriculum innovation were a resultant of PERSONALITY and SITUATIONAL variables. Just how these various PERSONALITY and SITUATIONAL variables interacted and what took place in the teachers' nervous systems as they interacted were not our concern. Instead, our problem was one of determining the "importance" of these variables, that is, the relative quantitative contributions which each variable made to the variance in the teachers' attitudes to curriculum innovation. The appropriate statistical model for this study was, therefore, that of Multiple Correlation Analysis (Kerlinger, 1973, a and b).

Now, as Steadman (1976) has observed concerning the techniques used for studying attitudes in the context of curriculum innovation, the tradition seems to have been that whereas pupils were considered "fair game" for the application of any technique, teachers on the other hand, were usually approached "indirectly" and their attitudes were more likely to be assessed on the basis of interviews rather than by answers to an attitude scale. There was also the "unspoken agreement" that no overt attempt should be made "to measure the personality of individual teachers". It seemed, therefore, that such a tradition would not allow us to take a quantitative approach to our problem, that is, one which required the collection of data about attitudes and personality traits for the purpose of statistical analysis. However, the study of teachers' attitudes to the curriculum innovation in TAMIL NADU had official support and there was no overt objection on the part of the authorities to quantitative methods. Consequently, our approach was mainly quantitative; this did not mean, of course, that the teachers themselves were particularly happy to complete questionnaires aimed at measuring their attitudes and their personality traits! Moreover, our statistical model was such that it was expected to leave a proportion of the variance in the teachers' attitudes to curriculum innovation unexplained since there were variables which could not be readily quantified and could not, therefore, be included in our explanatory framework. Consequently, in addition to a structured questionnaire about curriculum innovation which provided us with data that could be analysed statistically, we adopted a quasi-illuminative methodology (Parlett and Hamilton, 1972): we had on-site conversations with some teachers and coupled these conversations with observations of the teachers' performance in the classroom.

Concerning the Multiple Correlation Analyses themselves, it was a matter of deciding how best to measure the teachers' attitudes to curriculum innovation and which particular PERSONALITY and SITUATIONAL variables to include in our explanatory framework. Few studies have ascertained the contributions of PERSONALITY variables to teachers' attitudes towards curriculum innovation. A review of the pertinent literature was made as part of our PRELIMINARY STUDIES as explained in Appendix D. It transpired that Oliver (1953) had argued very cogently in a seminal paper on teachers' attitudes to education that the analyses of social attitudes in general (as carried out by Eysenck, 1944, 1947b) were applicable in some degree to educational attitudes. Oliver and Butcher (1962, 1968) had even developed scales such as those of Radicalism and of Tendermindedness for the measurement of teachers' attitudes in education. We also found that a dimension of Progressivism-Traditionalism had been identified in a number of studies of teachers' attitudes in education (Kerlinger, 1956, 1958, 1959; Lunn, 1970; Taylor and others, 1970/71). Moreover, the literature about curriculum innovation as such frequently referred to a certain degree of conservatism among teachers under the term "resistance to change". Owen (1970) saw such resistance as one of the important human factors in the process of innovation. He said that the "resistant figure" separated himself in "the cocoon of education" from changes in the competitive outside world. He (the resistant figure) might go through the motions of change but he was unlikely to internalise any alteration in his manner of working". He would change his behaviour more readily than he would change his attitudes; and those values which were centred on any gradually built-up "system of professional beliefs" would change even less readily.

Now, we knew that resistance to change in belief systems was the underlying theme in Rokeach's (1960) theory of Dogmatism, and it seemed, therefore, that Dogmatism was likely to account for some of the variation in teachers' attitudes to curriculum innovation. We assumed with Vacchiano (1968) that Dogmatism was a PERSONALITY pattern and was, therefore, a form of RESISTANCE-within-PERSONALITY. Rigidity (Rokeach, 1954, 1955) was another. However, we took seriously Harp's (1960) criticism of a study of the personality correlates of innovative technological practices (Rogers, 1957) and his implicit suggestion that measures of attitudes to innovation should be related to "basic personality structures". As a result, we decided to derive new measures of RESISTANCE-within-PERSONALITY which were anchored to Eysenck's (1970a) basic dimensions of personality (Neuroticism and Extraversion) and included these new RESISTIVITY FACTORS, as we called them, among our PERSONALITY variables.

With regard to the SITUATIONAL variables, they were selected because they were likely to be associated with variations in teachers' attitudes, that is, they were capable of constraining the interest which some teachers had in curriculum innovation as well as enhancing such interest in other teachers. Consequently the SITUATIONAL VARIABLES included amongst others the teachers' own "Experience of Bureaucracy" (Aiken, 1966) in the Polytechnics, their KNOWLEDGE of the curriculum innovation and a few BACKGROUND INFORMATION variables such as their Status and their Teaching Experience.

1.3 SOME CRITICISMS OF THE RELATED RESEARCH

Research in education which had investigated facets of the problem that we were interested in was not only scarce but deficient in many ways. Many studies were not directly centred around curriculum development projects as such. Nevertheless, it is of interest at this point to refer briefly to some of the research studies because by so doing the relevance of our own research methodology and design becomes more apparent.

Miles' (1964) well-known collection of studies of innovation in American education showed that empirical research in that field tended to be concerned mostly with the "adoption" of highly specific innovations such as audio-visual aids or programmed instruction. The oft-quoted research by Carlson (1965) studied the rate of adoption of modern mathematics by school superintendents - but not by teachers. Nevertheless, Carlson's research was relevant to the present study because it utilized the multiple correlation technique. However, the dependent variable was the rate of adoption of modern mathematics and this was determined by simply asking the superintendents when they adopted modern mathematics in their schools. The independent variables totalled twenty five and yet, personality characteristics as measured by standard personality tests were not included among these independent variables.

Lin's (1966, a and b) study of the diffusion of innovation in three Michigan schools (to which we referred above) had the merit of including Dogmatism among its variables but only as measured by a truncated Dogmatism Scale and without a rationale for including that variable (Dogmatism). The innovation consisted of a "schedule modification"; this was the term used to describe the change to a more flexible variation in the length and placement of class periods in elementary and secondary schools. Lin's study was of relevance to our research because he distinguished between "change orientation" (a general attitude towards change) and "innovation internalization" (the attitude toward a specific innovation). He found that Dogmatism correlated significantly with the former ($r = -.23$; $P < .05$, $df = 118$) but not with the latter ($r = -.14$). However, these observed correlations were of the zero-order; partial correlations were not calculated. An important methodological feature of Lin's approach was that he used clusters of items that were internally consistent instead of single items. However, his own criticism of his instrumentation was that his scales were too short. Thus, the scales for "change orientation" and for "innovation internalization" consisted of four items each. Our own view was that even for such short scales some items were redundant and that the clusters were therefore lacking in "discriminant validity" (Campbell and Fiske, 1959).

In England, Georgiades (1967) studied the attitudes of some 300 schoolteachers towards educational innovations such as teaching machines and language laboratories. The relevant dependent variable was attitude to "work-related change". This was measured by the Trumbo (1961) scale, an instrument developed for measuring attitudes towards technological change. Although the instrument was adapted for use in an educational setting, it seemed to us that it was faulty because the items were probably not representative of the universe of content for teachers' attitudes to curriculum innovation.

Taylor, Reid and Holley (1974) used a scale of "attitude to innovation" in a study of the English VIth Form Curriculum. Ideas for the items were culled from the literature especially from Gardner's (1964) work on the individual and the innovative society. However, the link between the eight items of the attitude scale and Gardner's marks of a negative attitude towards change was not so obvious. And again, it seemed unlikely that only eight items were representative of the universe of content for teachers' attitudes to curriculum innovation. Moreover, as in Georgiades' work, the assumption seemed to have been that this universe was a unidemensional one. Nevertheless, as in Lin's study, there was some awareness of the need to use clusters of items that were internally consistent for measuring a particular attitude.

Other researches such as the one by Harlen (1973) or that by Hiles (1972) could be mentioned here but the few examples already cited highlight some of the shortcomings of previous researches about teachers' attitudes to curriculum innovation. Generally speaking, our criticism of these researches was that so often one or more of the shortcomings were present; in other words, it was not uncommon to find that the researches did not make explicit how attitudes were conceptualised, that the measures of attitudes used were not developed from the teachers' own perceptions of innovations, that the reliability and validity of those measures were not discussed, and that no attempt was made to obtain the dimensionality of the universe of content for teachers' attitudes to curriculum innovation.

Empirical and quantitative studies of the correlates of teachers' attitudes to curriculum innovation were few in number. Apart from those already cited, there were for example, those of Childs (1965), Van Alfen (1967), Chambliss (1968), Bridges and Reynolds (1968), Khan (1968), Walsh (1971), and Grant (1972). Usually inferences about relationships between variables were made on the basis of zero-order correlations and not of partial correlations. The dependent variables in the correlation analyses were teachers' responses either to single items or to clusters of homogeneous items. However, even such clusters represented the organization of the teachers' responses at a rather low level in terms of Eysenck's (1970, a) hierarchy of personality organization. Moreover, the correlational studies were not replicated and no attempt was made to discuss possible causal models. The rationale for including PERSONALITY amongst the explanatory variables was not always made explicit. Indeed, the concept of RESISTANCE-within-PERSONALITY was not discussed in any depth. Instead, personality questionnaires such as Cattell's (1964) 16PF and the Edwards (1959) Personal Preference Schedule (EPPS) were administered *en bloc* (Walberg, 1967; Zimmerman, 1971) and all the factors in a particular personality test were correlated with the measures of teachers' attitudes to curriculum innovation. Moreover, there was no attempt to discuss the process by which the negative effects of RESISTANCE-within-PERSONALITY might be counteracted by, for example, the teachers' increasing KNOWLEDGE of a specific curriculum innovation through participation in it.

1.4 THE OVERALL PLAN OF THE PRESENT STUDY

We began with a theoretical discussion of the psychological process which, in our submission, mediated the development of teachers' attitudes to curriculum innovation and accounted for variations in these attitudes. We derived two PROPOSITIONS or General Hypotheses from that discussion and then presented the rationale for the analytical procedures which we adopted to test specific sub-hypotheses. The report of our empirical investigations then followed. These investigations aimed mainly at determining the proportion of the variance in the teachers' attitudes which could be explained by the variables in our explanatory framework, that is, by the PERSONALITY and SITUATIONAL variables. The research plan was to approach the investigations in two stages as shown in Figure 1.1. The research at STAGE A focused on the innovation in Engineering Drawing in TAMIL NADU (see Appendix A) whilst the research at STAGE B focused on an innovation in Secondary Schools Mathematics in England (see Appendix B). The plan was to determine the dimensionality of the teachers' attitudes to curriculum innovation in TAMIL NADU at STAGE A and also to test our hypotheses concerning the relationships between these attitudes and the independent variables in our explanatory framework. From the results of the Multiple Correlation Analyses the proportion of the variance in the teachers' attitudes which could be explained by the independent variables was determined. The only RESISTANCE-within-PERSONALITY variable included in the framework at this stage was Dogmatism. In addition to our statistical analyses, we also made a quasi-illuminative study of other aspects of the innovation in India.

The aim at STAGE B was to replicate the statistical study done in India and also to extend the explanatory framework in order to include other RESISTANCE-within-PERSONALITY variables, namely, Rigidity and our derived RESISTIVITY FACTORS.

1.5 THE IMPORTANCE OF THE PRESENT RESEARCH

It is evident from the criticisms that we have made above of the study of teachers' attitudes to curriculum innovation that we should try in the present study to avoid the shortcomings of previous studies in this field. We set out to do just that and in so doing give the study its importance. In other words, the importance of the study stems from our attempt to obtain from our

FIGURE 1.1

THE RESEARCH PLAN FOR THE EMPIRICAL INVESTIGATIONS: A TWO-STAGE APPROACH

STAGE A (The research in SOUTH INDIA)	PART (I):	The correlates of the teachers' attitudes to curriculum innovation in Engineering Drawing in SOUTH INDIA	CHAPTER 4:	The PROCEDURES and RESULTS for the study of the correlates of the teachers' attitudes to curriculum innovation in SOUTH INDIA
	PART (II):	The quasi-illuminative study in TAMIL NADU	CHAPTER 5:	Three investigations into the innovative context in TAMIL NADU
STAGE B (The research in England)	PART (III):	The correlates of the teachers' attitudes to curriculum innovation in Secondary School Mathematics in England	CHAPTER 6:	The PROCEDURES and RESULTS for the study of the correlates of the teachers' attitudes to curriculum innovation in England

NOTE:

As the Table of Contents shows, these investigations are reported in the study after discussing our theoretical formulations and the rationale for our procedures.

samples of teachers, the dimensionality of the universe of teachers' attitudes to curriculum innovation at different levels of organization of teachers' responses, to "explain" the variation in the teachers' attitudes not only by Dogmatism but by other forms of RESISTANCE-within-PERSONALITY and with other independent variables partialled out, to determine the relationships between the teachers' KNOWLEDGE of a specific curriculum innovation and their attitudes to the innovation, to replicate the study cross-nationally and in different sectors of the education system (technical and secondary), and to discuss possible causal models. Thus, the study extends knowledge concerning the structure of teachers' attitudes to curriculum innovation, the relative quantitative "importance" of various PERSONALITY and SITUATIONAL variables, and the similarity in teachers' resistance to curriculum innovation across subject and national boundaries.

CHAPTER 2

THEORETICAL FORMULATIONS

2.1 INTRODUCTION

The aim in this chapter was to make explicit our theoretical position and provide the basis for our hypotheses. We were concerned essentially with a discussion of theories which we thought had a bearing on our problem.

We began with an examination of terms such as "curriculum" and "innovation" and stated the meanings of those terms for the purpose of our study. Next we went on to propose a model for the psychological process which, we suggested, mediated teachers' "adoption" of curriculum innovation. A discussion followed in which we established that curriculum innovation provoked conflict and uncertainty. The motivation of teachers under these conditions was examined in terms of psychological theory and the part which RESISTANCE-within-PERSONALITY (in the form of Dogmatism) played in the process of motivation was discussed. How other forms of RESISTANCE-within-PERSONALITY might affect teachers' reactions was also discussed. But before doing so the variable KNOWLEDGE of curriculum innovation had also to be examined because its influence seemed to be in opposition to that of Dogmatism in "formal organizations" (such as schools and colleges were, generally speaking). Finally, we tried to apply tentatively some of the insights provided by Catastrophe Theory to the study of our problem.

2.2 DEFINITION OF THE TERMS "CURRICULUM" AND "INNOVATION"

Before converging on the central theme of the present study (that is, on teachers' attitudes to curriculum innovation and their relationships to PERSONALITY and SITUATIONAL variables), it seemed desirable to state in what sense terms like "curriculum" and "innovation" were used in the present study and to examine briefly the process of curriculum innovation against the background of trends in curriculum change during the past fifty years or so of educational history in England and in the United States of America.

Hamilton (1976) has confirmed an impression that we had in searching the literature about the curriculum,namely, that the curriculum was an "ill-defined area of intellectual enquiry ". According to Maclure (1972), the Anglo-Saxons for much of the time used the term "curriculum" to mean "what happens to children in shcool as a result of what teachers do" - a definition given by Oliver (1965). As Kerr (1968) has remarked, many writers used the term loosely as being synonymous with 'syllabus', 'course of study', 'subjects' or even 'timetable'". Dottrens (1962) highlighted a rather similar point by listing the "amazing variety of names" for administrative documents which were used in various countries for "exactly the same purpose". Some of these were "syllabus", "programme of instruction", "study guides", "teachers' guides", "curriculum development" and notably the French ones: "programmes d'enseignement", "plan d'études et instructions pédagogiques", "plan d'éducation" and so on. Kerr himself settled for a modified definition of Herrick and Tyler (1950). According to this definition, the curriculum was all the learning which was planned and guided by the school, whether it was carried on in groups or individually, inside or outside the school. Hirst (1970) took the term to be the label for a programme or course of activities which was explicitly organised as the means whereby pupils might attain the desired objectives, whatever these might be. More often than not, we had in mind Hirst's definition when we used the term curriculum in the present study and our concern was with teachers' attitudes towards two subject curricula: one for Engineering Drawing in SOUTH INDIA and one for New Mathematics in England. The severe limitations of the classical "objectives model" for the curriculum as well as the alternative "process model" (Stenhouse, 1970/71) were known to us but the arguments for and against these alternatives seemed to us to be rather irrelevant to our immediate purpose in the present study.

As for the term "innovation", Rogers (1971) has defined it as "an idea, practice or object perceived as new by an individual". It mattered little, so far as human behaviour was concerned, whether or not the idea, practice or object was "objectively" new as measured by the lapse of time since its first use or discovery. It was the perceived or subjective newness of the idea, practice or object for the individual that determined his reaction to it. If the idea, practice or object seemed new to the individual, it was an innovation. Barnett's (1953) discussion of innovation and of novelty in the context of cultural change was illuminating and appropriate. For Barnett, innovation was a comprehensive term covering all kinds of "mental constructs" whether these could be given representation or not and novelty was to be understood in the same way.

However, the term "innovation" was frequently used according to Hoyle (1971) to indicate the process of diffusion of an idea or practice as well as the idea or practice itself. Pellegrin (1966) has explained that innovation was in fact a series of processes. It depended not only upon the discovery and adoption of an idea, practice or object, but also upon other processes, such as those of implementation, experimentation, evaluation, diffusion and institutionalization.

Pellegrin made an important distinction between innovation and change. "Change" according to Pellegrin referred to the whole spectrum of processes, whereas "innovation" dealt with a more limited number of factors in the total change process. Huberman (1973) has explained that what distinguished an innovation from change in general was the element of deliberate planning or intention.

It seemed to us that like the terms "curriculum" and "innovation", the term "curriculum innovation" could also give rise to confusion. In particular, the term was sometimes used as if it were synonymous with "curriculum development". Kelly's (1970/71) description of curriculum innovation as a four-stage process with "development" of a proposed new curriculum as only one of the stages clarified the distinction between the two terms for us. The first stage was the INITIATION of the curriculum innovation in question; the second stage was the DEVELOPMENT of the proposed new curriculum; the third stage was the DIFFUSION of knowledge about the newly developed curriculum and the fourth stage was the IMPLEMENTATION of the newly developed curriculum.

Furthermore, it seemed to us necessary to distinguish between curriculum innovation as a specific "inanimate object" (Hull, 1973) and curriculum innovation as an abstract "concept". Without, however, wanting to enter into a philosophical argument about the precise meaning of these terms, the implication of this distinction for us was simply that Kelly's stages seemed to apply to <u>specific</u> curriculum innovations, which centred around <u>specific</u> curriculum development projects. For most teachers, curriculum innovation in that sense was a novelty; it connoted not only new educational ideas, but also the new support materials that were associated with a particular curriculum development project. However, it seemed likely that through the normal psychological processes of discrimination and of generalization (from several exemplars of curriculum innovation), a general concept of curriculum innovation emerged. We ourselves used the term in both senses in the present study but for most of the time it was curriculum innovation in the sense of a specific "object" that we had in mind.

Where then did curriculum innovation in this sense stand within the process of curriculum change? No single, clear answer to that question emerged from the literature. It was probably impossible to construct a single universal model of the process of curriculum change and to locate the process of curriculum innovation in it. However, for the purposes of the present study we conceptualised the process of curriculum change as shown in Figure 2.1. The diagram was admittedly an over-simplified representation of the process but it served as a useful analytical model.

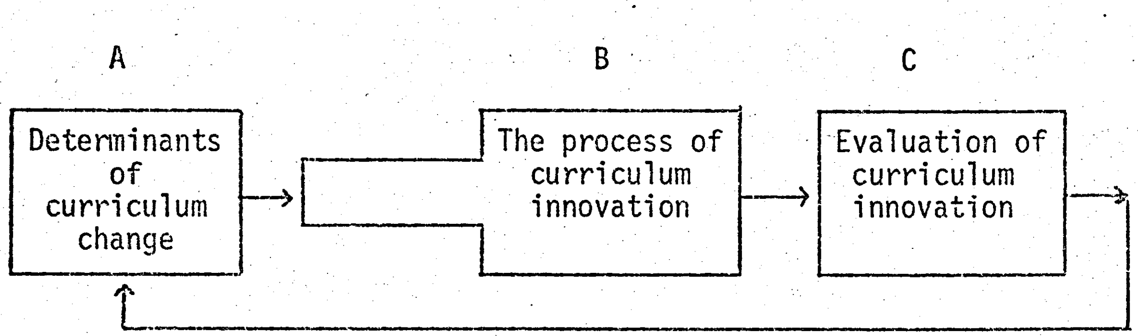


FIGURE 2.1 THE PROCESS OF CURRICULUM CHANGE

Some of the determinants of curriculum change (Box A) were highlighted in the publications of, for example, the Schools Council (1971, 1973) in England, and the National Society for the Study of Education (1971) in the U.S.A. However, it was in Box B that our interest was, and in the next section we turned specifically to it, that is, to the process of curriculum innovation. To put emphasis on Box B was not to imply that Box C was not relevant to the present study. Indeed teachers' attitudes to curriculum innovation were often taken to be part and parcel of evaluation studies of curriculum innovation. But it will become clear below in the present chapter that the psychological process that we were probing into was a particular feature of Box B.

2.3 THE PROCESS OF CURRICULUM INNOVATION

Figure 2.2 was also an over-simplified model. It was derived from the writings of Kelly (1970/71) and of Havelock (1971), but Kelly's model of the process of curriculum innovation was itself inspired by the work of Bricknell (1961) and by that of Clark and Guba (1967). This model of innovation was of the "Centre-Periphery" type and has been criticised by Schon (1971). However, it seemed to be the model which the curriculum innovators utilized for the curriculum innovations which we studied in India and in England. It was therefore appropriate to make reference to this type of model here. In Figure 2.2, the people in the USER SYSTEM were the teachers and students who implemented a particular curriculum innovation. The people in the RESOURCE SYSTEM were the innovators and some other "resource" persons who were involved in the management of the innovation.

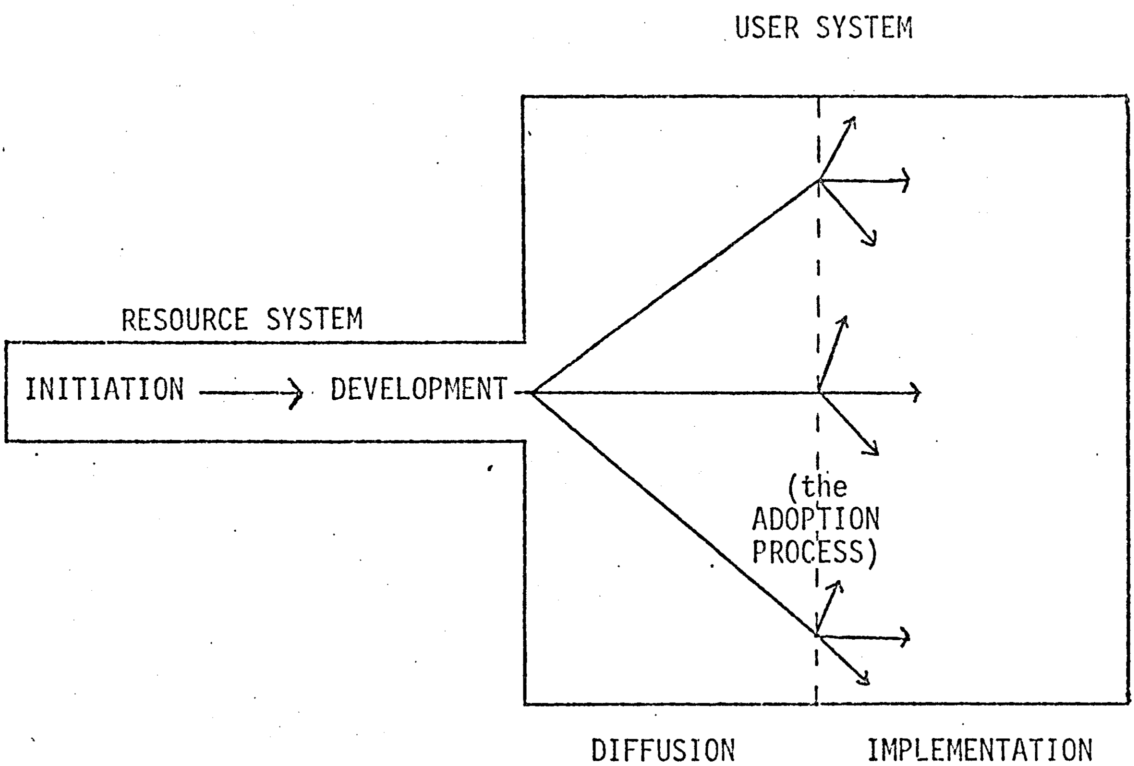


FIGURE 2.2 MODEL OF THE PROCESS OF CURRICULUM INNOVATION INCORPORATING THE ADOPTION PROCESS.

The term "adoption process" required clarification because like the word "innovation" it was capable of two interpretations. If these were denoted as A_o and A_s respectively, then A_o was the adoption process when defined <u>objectively</u>, that is, as an "interphase" (shown by a dotted line in Figure 2.2) between diffusion and implementation (Kelly (1970/71)); A_s was the adoption process when defined <u>subjectively</u>, that is, as the mental process through which an individual passed from first hearing about an innovation to adopting it finally (Rogers, 1962); in other words, adoption in this sense was the psychological acceptance of the innovation. It was in A_s and not in A_o that we were interested in the present study or more specifically, it was in A_s when A_o was already a "fait accompli" in a "formal organization".

However, Rogers' term "adoption process" (A_s) has now been superseded by that of "Innovation - Decision Process" (Rogers, 1971). The process was conceptualised by Rogers and Shoemaker as consisting of four stages. The first stage was that of KNOWLEDGE. This was the stage when an individual was exposed to the existence of a particular innovation in question and gained some understanding of how it functioned. At the second stage (the PERSUASION stage) the individual became more psychologically involved with the innovation and formed a favourable or unfavourable "attitude" toward the innovation. His PERSONALITY as well as the norms of his social system affected such things as where he sought information and how he interpreted the information which he received. At that stage, a "general perception" of the innovation developed. According to Rogers and Shoemaker, the perceived attributes of an innovation such as its complexity and its compatibility were especially important at that stage. The third stage was that of DECISION. At that stage the individual engaged in activities which led to a choice to adopt or reject the innovation. Finally at the fourth stage, the stage of CONFIRMATION, the individual sought reinforcement for the decision he had made, but he could well reverse his previous decision if exposed to conflicting messages about the innovation.

We took some exception to the description of the innovation-decision process given by Rogers and Shoemaker because it depicted the stages in a linear fashion whereas they were probably related in a much more complex way. In particular, there was the implicit suggestion that "attitudes" to an innovation were formed at the PERSUASION stage, that is, prior to the individual's involvement in activities which were conducive to the adoption (A_s) or rejection of the innovation at the DECISION stage. We preferred to think of these two stages as making up only one stage which mediated the adoption or rejection of innovation. The acquisition of attitudes to innovation was for us a continuing, developmental, learning process (Hilgard, 1956), taking place through a personal psychological interaction with all aspects of the innovative environment. We assumed that when viewed subjectively, adoption (A_s) of an innovation was tantamount to the formation of a favourable attitude towards the innovation; conversely, rejection was tantamount to the formation of an unfavourable attitude.

Like Rogers and Shoemaker, however, we recognised the CONFIRMATION stage as a distinct stage because it was possible for an individual to be exposed to conflicting messages about a specific curriculum innovation after having adopted (A_s) it or rejected it and consequently to reverse his decision about it. Like these authors too we assumed that PERSONALITY variables were antecedent to the formation of attitudes to curriculum innovation. This point assumed considerable importance in the present study when we discussed causal models in order to try and explain the relationships between the teachers' attitudes to curriculum innovation and the correlates of these attitudes (see Chapter 3).

2.4 THE PROPOSED MEDIATING PSYCHOLOGICAL PROCESS FOR THE ADOPTION OR REJECTION OF CURRICULUM INNOVATION

Figure 2.3 represents our model for the psychological process which mediates the adoption (A_s) or rejection of curriculum innovation. The model was only meant to serve our purpose for the present study. It placed emphasis on the individual's own internal control over the

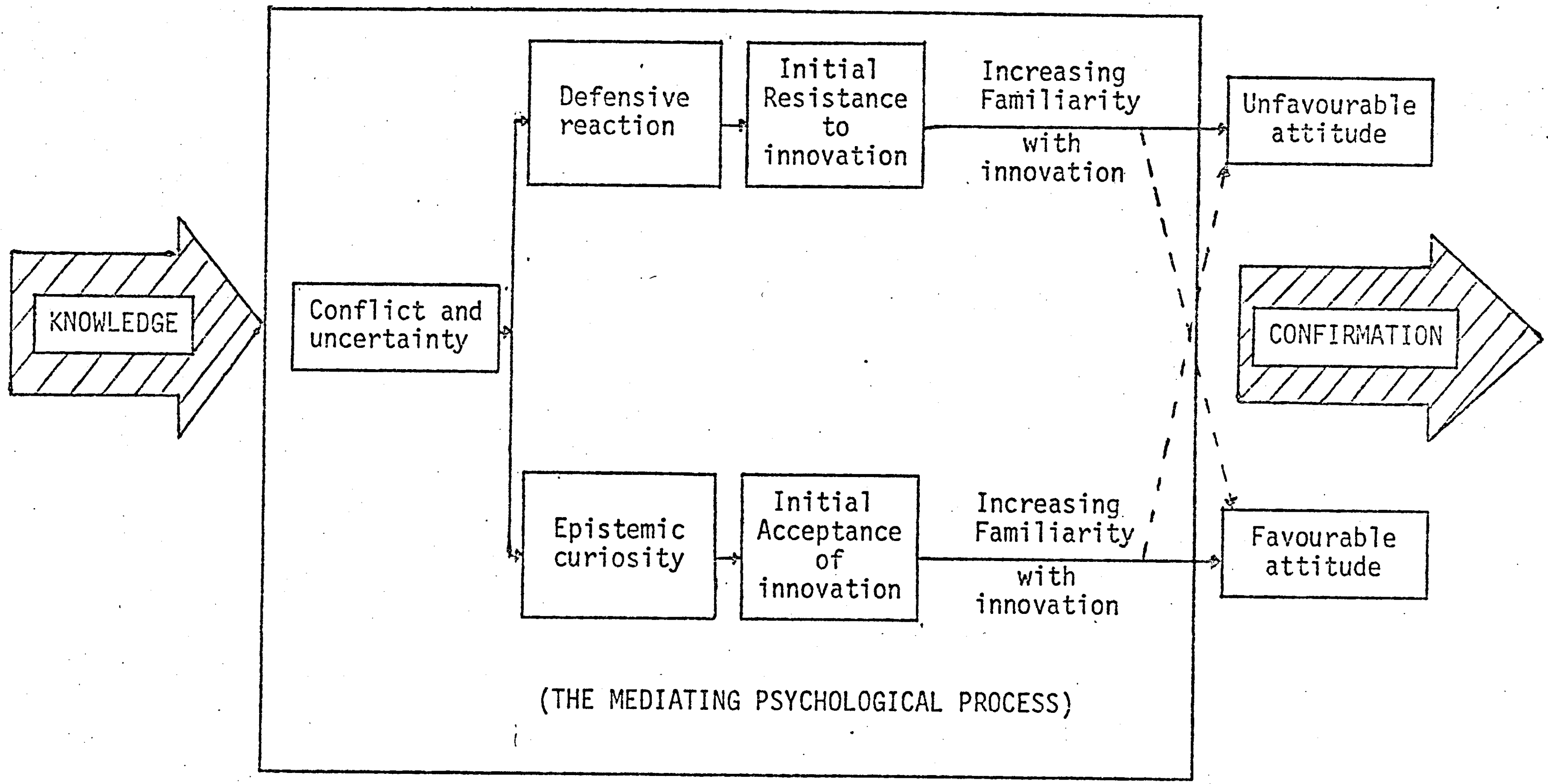


FIGURE 2.3 MODEL FOR THE "INNOVATION - DECISION PROCESS" SHOWING THE PROPOSED MEDIATING PSYCHOLOGICAL PROCESS

processing of the information which reached him about the curriculum innovation. The intention was to draw attention to the part played by psychological factors in the adoption process (A_s) and in particular by DOGMATISM as a form of RESISTANCE-within-PERSONALITY. We also tried to indicate the point at which the structure of an individual's "belief-disbelief system" (Rokeach, 1960) became effective in exercising internal control over the processing of the new information which reached him in the context of a specific curriculum innovation. Moreover, we incorporated in the model the notion that teachers' FAMILIARITY with curriculum innovation through their participation in it was probably one of the factors which also contributed to the variation in their attitudes to it (the curriculum innovation).

We left it to the next Section below to discuss in some detail the ideas which prevailed on our thinking in arriving at the model in Figure 2.3. The discussion of the mediating psychological process drew largely on theories of conflict and uncertainty, of attitude and personality, and of "epistemic curiosity" (Berlyne, 1960). An empirical verification of the model was not intended in the present study. All that we could hope to attempt was to determine the "importance" of variables like RESISTANCE-within-PERSONALITY and FAMILIARITY which, we postulated, were involved in this mediating psychological process. Consequently, in the next section below we discuss the ways in which RESISTANCE-within-PERSONALITY and FAMILIARITY might jointly bring about variations in teachers' attitudes to curriculum innovation.

2.5 A THEORETICAL DISCUSSION OF THE DYNAMICS OF ATTITUDE FORMATION (WITH REGARD TO THE ATTITUDES OF TEACHERS TOWARDS CURRICULUM INNOVATION)

We assumed that resistance to change was a defensive reaction against conflict and uncertainty in the context of curriculum innovation and consequently we examined these concepts first.

We conceptualised curriculum innovation as a stimulus-object and made the bold assumption that the process by which the stimulating elements of this complex "object" were perceived by teachers was psychologically no different from the well established process by which stimuli were perceived by the human organism and responded to. Forgus (1966) has defined perception as a process; one by which information was received or extracted about the environment. This process of perception involved the classification of novel stimuli or novel combinations of stimuli and the recognition of familiar stimuli or sets of stimuli. (Warr, 1968; George, 1969; Bruner, 1974). It was known that every event or physical object was either recognised by comparison with an existing record, or classified as "new" and put into an existing, but general, classification. Alternatively, a new classification might be set up, as a result of the properties which the event or object possessed. It followed from this formulation of perception that we could consider the perception of curriculum innovation as the process of classifying, recognising, and interpreting diverse stimulus events, objects, persons and concepts associated with the innovation. Novel inputs in the curriculum resulted in the arousal of people involved in the innovation and the "orientation reaction" (Pavlov, 1927; Lynn, 1966) was energised. This was only a momentary reaction and the amount of "arousal" depended on the configuration of the expectancies that were challenged by the novel inputs.

However, according to Berlyne (1960; 1965), novelty induced CONFLICT. By this he meant that there was an interference among incompatible responses. CONFLICT arose because any new pattern of stimulation was "sufficiently similar" to several familiar stimulus patterns to evoke responses appropriate to all of them. But since many of these responses were incompatible, there was a simultaneous instigation of incompatible responses giving rise therefore to conflict.

Our hypothesised mediating psychological process assumed that "conflict" was a crucial factor in teachers' reactions to curriculum innovation. But the conflict generated in the context of curriculum innovation was not only perceptual. It was also conceptual; that is, it was conflict between beliefs, thoughts, and ideas. The reason was that curriculum innovation imported into the teacher's world a number of new concepts about teaching and about the curriculum. Berlyne recognised that there could be incompatibilities between symbolic response patterns (i.e. between beliefs, thoughts, and ideas), and that these incompatibilities ensued in "conceptual conflict"; incompatible "schemas" (Bartlett, 1932; Vernon, 1955; Parry, 1967), were activated and incompatible responses were instigated. Berlyne also identified a number of reasons for conflict; complexity, incongruity, ambiguity and perplexity were among these. It was therefore necessary to clarify the meaning of these terms and to identify their presence in the context of curriculum innovation before pursuing our analysis of teachers' reactions in the conflict-ridden situation of curriculum innovation.

COMPLEXITY referred to the amount of variety in the stimulus pattern. It depended on the number of psychologically distinguishable elements in the stimulus pattern and on the dissimilarity between these elements. It seemed that a possible explanation of conflict in this instance was that there was an "occlusion of information"; in other words, because of the limitations of channel capacity, no more than a few elements in the stimulus pattern could be responded to at once. The assumption was that a nervous system acted to some extent as a single communication channel with a limited capacity (Broadbent, 1958).

INCONGRUITY arose when the individual construed the stimulus situation as deviant from the "schemas" that he usually employed as a psychological yardstick in interpreting a particular class of events. Stored information based upon past inputs failed to match present inputs. Hunt (1963) described as "incongruity" the discrepancy between the familiar, "standard", TOTE Units (Miller, Gallanter, Pribram, 1960) against which new inputs were matched and the new inputs themselves. However, he also used the term "incongruity" in a wider sense to include other incompatibilities such as cognitive dissonance (that is, the inconsistency amongst cognitive elements (Festinger, 1957)). It is in this more general sense that the term "incongruity" is used subsequently in the present study.

AMBIGUITY was the term used when the implications of the information input were not clear. This happened, for example, when the intent of the "message" being transmitted was not conveyed clearly; or when there were distortions during the communication of the "message".

PERPLEXITY described another aspect of uncertainty. It arose when there existed a number of mutually exclusive beliefs about a stimulus-object with some evidence favouring each of these beliefs but no way of knowing for certain which was true.

Now, according to Berlyne, conflict generated uncertainty. Subjectively, an individual was in a condition of uncertainty when he was exposed to a situation that might, in the light of past experience, be followed by any number of mutually exclusive stimulus events each having its own probability. The individual then found it difficult to categorise stimulus events and had to hold in readiness mutually incompatible responses. This subjective feeling of uncertainty might co-vary with, but was distinct from <u>objective</u> UNCERTAINTY (H) as this term was defined in Information Theory (Shannon and Weaver, 1949; Lin, 1973). It seemed to us possible and legitimate to use the concept of objective UNCERTAINTY in order to establish the degree to which it might be said to exist about curriculum innovation; and, indeed, in Appendix P we showed by using Hotyat's (1967) data that teachers' UNCERTAINTY concerning the very basis of innovation was greater for innovation based on the "results of research" than for innovation based on the "practical suggestions by colleagues" in the ratio of approximately 3:2. However, an objective measure of UNCERTAINTY was not all that useful for our present analysis of teachers' attitudes to curriculum innovation. For, although objective UNCERTAINTY might be expected to co-vary with subjective uncertainty, it would not tell us a great deal about the <u>feeling of uncertainty</u> experienced by the teachers, its concomitant psychological effects, and the ways in which it might manifest itself.

For a vivid description of the subjective uncertainty which resulted from the impact of change on individuals within a social system, we turned to Schon (1971). According to Schon, change in organizations had an impact on persons within the organizations because beliefs, values, and the sense of self had their being in social systems. Transforming the system, he said, meant passing through "zones of uncertainty", in the sense of being at sea, of being lost, of confronting more information than one can handle. Schon enlarged on this: a situation that provoked uncertainty was one in which there was an "information overload"; there were "too many signals". It was a situation in which as yet there was no plausible "theory": that is, there were no coherent views within the social system about, for example, its purposes and its future, and no clear notions about what kinds of performance were valued. Schon's description of subjective uncertainty culminated in a poignant, if dramatic statement, that the feeling of uncertainty was anguish and that the depth of anguish increased as the threatening changes struck at more central regions of the self.

It seemed reasonable to suppose that teachers' subjective experience of uncertainty in the face of curriculum innovation was not unlike that described by Schon for social systems generally. Consequently we searched the relevant literature about curriculum innovations in order to discover to what extent uncertainty and conflict arising from complexity, incongruity, ambiguity and perplexity prevailed in the context of curriculum innovation. In the next section below we discuss briefly our findings and then go on to examine how such uncertainty and conflict might energise the forces of RESISTANCE-within-PERSONALITY.

2.6 CONFLICT AND UNCERTAINTY IN THE CONTEXT OF CURRICULUM INNOVATION

Eggleston (1970; 1975) has analysed the conflict in curriculum decision-making and in the process of curriculum change in terms of attitudinal variables, each indicating two mutally exclusive alternative orientations such as the "traditional orientation" and the "futuristic orientation". The "traditional orientation" was characterised by attitudes which favoured, for example, the retention of long established curriculum patterns with traditional subject decisions and contents. The "futuristic orientation" was characterised by support for curricula that were based on "discovery" or "problem solving" approaches. The suggestion was that different orientations such as these had led to the development, indeed to the institutionalisation of conflict over the curriculum.

As for uncertainty, according to de Landsheere (1974), educators knew (or thought they knew) their objectives. Indeed, Reid (1975) has asserted that in planning their lessons experienced teachers could, in general, predict with a high degree of certainty what their behaviours would entail by way of classroom activities, the materials that they would use, the time they would spend and the work that they would ask of students. Consequently, as de Landsheere went on to argue, innovation was "tantamount to the introduction of uncertainty" into the educational system; innovation and education were mutually exclusive. The extent of such uncertainty was observed by Barry (1974). She described vividly how for a curriculum innovation in Engineering which she studied, there was considerable uncertainty amongst teachers about, for example, whether students would react favourably to the new syllabus, whether they would succeed in their examination, whether they would exhibit a deeper understanding of fundamental concepts, whether they would be better able to apply their knowledge and skills and whether they would obtain appropriate jobs later.

A more detailed study of the literature on curriculum innovation showed that innovatory curriculum development projects tended to be characterized by complexity, incongruity, ambiguity and perplexity, and our own inference was that these characteristics probably gave rise to uncertainty and conflict. Taking "complexity" first, an OECD report (1975) identified "project complexity" as one of the three kinds of "internal difficulties" that loomed largest in curriculum development projects; the others were personnel problems and problems of conceptualisation. According to Maclure (1972), curriculum development was a "complex piece of curriculum research whereby a number of points of view or hypotheses were being tested".

For us, the complexity of curriculum innovation was readily gauged from the complex analytical procedures that were suggested by Becher (1972) for the study of curriculum development projects. Fifteen possible characteristics of curriculum projects were listed and placed each in a separate row of a matrix. Each of these characteristics was in turn trichotomised. "Teaching techniques", for example, were grouped into three categories:

discovery methods/inductive-heuristic,
group projects/discussion,
self-instructional/practical tests.

This process of trichotomisation when repeated for each of the 15 characteristics, yielded three columns or clusters of fifteen characteristics each and a matrix of 15 x 3. In all, therefore, forty-five (15 x 3) possible descriptors of projects were obtained. Later, Becher revised his matrix and reduced it to one of eight rows (the characteristics) and three columns (the clusters). Nonetheless it reflected a fairly high level of complexity for curriculum projects. This complexity was even more apparent when it was realised that it was not always possible to describe the "style" (Maclure, 1972) of a curriculum development project solely in terms of the set of descriptors within any one single cluster. The description that befitted a particular project might have to be composed of an assortment of descriptors taken from all the three clusters! Yet, according to Reid (1975) often innovators were too close to the practical concerns of administrators and consequently tended "to deny complexity" instead of recognising it "as an essential given of the situation". Moreover, "dissemination studies" of innovations probably "distorted the complexity" of the process of curriculum change by focusing on a few selected variables only (and on survey techniques!) (Brügelmann, 1975).

It seems that the dilemma which curriculum innovators had to face was this. On the one hand for curriculum innovation to be complete it was desirable to bring about changes in a number of "parts" or "elements" of the whole curriculum all at the same time and to evaluate these changes thoroughly. This was quite understandable because to be successful, curriculum innovation had to be comprehensive rather than piecemeal in view of the many interlocking problems of change (Hooper, 1971). But, on the other hand, to do this was to build up such a complex picture of curriculum innovation that it bred uncertainty.

However, it seems reasonable to suggest that not all curriculum innovations were characterised by a very high degree of "complexity". The term "complexity" when used in the context of an innovation referred in general, to the number of parts of the innovation, the number of behaviours or skills which should be learned or understood before adoption was possible, or the number of procedures that were required to maintain the innovation effectively over the time (Havelock, 1971). This conceptualisation of complexity seemed to us applicable to curriculum innovation because curriculum innovation proper involved changes in a number of components of the curriculum process, such as curriculum objectives and curriculum evaluation, and the learning of a number of new behaviours, skills and procedures. This conceptualisation was in line with the psychological perspective of complexity which we have already described. In fact, we could define a "complex" curriculum innovation as a psychological "object" in which novel elements were numerous and diverse. However, presumably not all curriculum innovations had many and diverse novel elements and it was therefore possible to order curriculum innovations along a complexity continuum, that is, from "less complex" to "more complex". The point was that it was the curriculum innovations at the "more complex" end of the continuum that were more likely to be the potential sources of conflict and of uncertainty and to diffuse relatively slowly (Miles, 1964); and Owen (1973) thought that if anything that was new in education was felt to be too complicated, too new or too revolutionary by teachers, then resistance was "bound to be higher".

Turning next to the incongruities to be found in the context of curriculum innovation, Figure 2.4 shows our analysis of the numerous incompatibilities which could originate from the implementation of curriculum innovations.

A and B were the sets of formulations about curriculum theory and practice as developed by the curriculum innovators who promulgated a particular innovation. On the other hand,practising teachers had their own formulations of curriculum theory and practice (D and E respectively). The perspectives of the innovators and those of the teachers on the actual implementation of the innovation were denoted by C and F, respectively.

As our matrix shows, there were, for example, the incompatibilities between the formulations of the innovators and those of the classroom teachers about curriculum theory and practice. (Cells A/D and B/E, respectively). Probably one of the reasons for such incompatibilities was the fact that for many teachers their ideas about teaching were anchored strongly at a number of points. These were, for example, the "bodies of doctrine" (Shipman, 1974) which offered some ideological or professional perspective. Teachers identified strongly with their professional skills and their "subject knowledge" (Stenhouse, 1975); often their professional self-respect was based on such skills and knowledge. Next, there were the practitioners' tips to teachers; these tips were likely to have proved useful in classroom transactions. No less importantly, teachers had their own cognitions or "response predispositions" (Adams, 1975) developed from their own practical experience of teaching, that enabled them to interpret the reality of the classroom and react to it. Thus, teachers in the "USER SYSTEM" had a strong anchorage in certain formulations of curriculum theory

FIGURE 2.4

PERSPECTIVES OF CURRICULUM INNOVATORS AND OF PRACTISING TEACHERS

	Perspectives of curriculum innovators in the "Resource System"			Perspectives of Practising Teachers in the "User System"		
	Formulations of curriculum theory	Formulations of curriculum practice	The Implementation of curriculum innovation	Formulations of curriculum theory	Formulations of curriculum practice	The Implementation of curriculum innovation
	A	B	C	D	E	F
A	-					
B	-	-				
C	X	X	-			
D	X	X	X	-		
E	X	X	X	-	-	
F	X	X	X	X	X	-

X = possible incompatibility and potential source of conflict

- = no incompatibility

and practice; consequently, if an account of classroom transactional processes given by curriculum innovators differed from that of the teachers, it was likely to be incompatible and to provoke conflict and uncertainty.

Figure 2.4 shows that conflict could also arise as a result of "incompatible interpretations" (Brügelmann, 1975) by the USER SYSTEM of what the guidelines given by the RESOURCE SYSTEM really meant in practice (Cell F/A). This conflict reflected the gap between "intent" and "practice", to use the terminology of MacDonald and Walker (1974); this was the gap between "product idealisation" and "product implementation".

An indication of incompatibilities of various types was seen in Barry's (1974) study of Engineering Craft Studies already referred to. She found that some fifty per cent of the teachers who preferred the older syllabuses to the new integrated syllabus of Engineering Craft Studies felt that they were considerably "restricted" in teaching the way they considered to be "the best method" of teaching their students. Many teachers could not even see the relevance of the "general aims" of the new syllabus to their particular subject; in addition, many Mathematics and Science lecturers tended to teach mainly in the traditional "lecture, blackboard and chalk method", no matter what topic they were teaching.

The literature of curriculum innovation also described incompatibilities which had their origins in the organizational styles of schools and colleges. The diagram below represents our attempt to identify the onset of this kind of incompatibility and conflict. We dichotomised the organizational style of a school/college as "pre-innovation" and "post-innovation", the latter being the pattern of organisation as the innovators <u>expected</u> it to be; similarly for the curriculum.

		School/College Organis-ational style	
		Pre-Innovation	Post-Innovation (Expected)
School/College Curriculum theory and practice	Pre-Innovation	a	c
	Post-Innovation (Expected)	b	d

We inferred that there would be incompatibility under conditions (b) and (c) and that conflict would result.

We found evidence of (b) in, for example, Shipman's (1974) description of the difficulties encountered by the Keele Integrated Studies Project leaders, when planning to introduce "enquiry-based" integrated studies through team teaching. Ideally, what was required was a series of different sized spaces for individual and small group work, and for "whole year" group work. But, as Shipman remarked, school buildings were not designed for this pattern of work. They were designed for <u>one</u> teacher with <u>one</u> class in <u>one</u> room. Furthermore, the team teaching approach required whole blocks of time to be allocated to the project. But most of the work of the schools remained traditional and was planned on the basis of the conventional forty minute period. Ultimately, the difficulties of room allocations and of time-tabling were surmounted but not without "opposition from other classes".

We have an example of (c) in Barker Lunn's (1970) study of streaming in English primary schools. Barker Lunn observed that many schools which changed to a policy of non-streaming retained teachers whose beliefs and attitudes about the curriculum nevertheless favoured streaming strongly. These teachers continued to use classroom practices that were inappropriate to the new type of organisation. Yet, the aims and practices which streamed and unstreamed schools embodied were different: their views about children and their philosophies of education were different. However, Barker Lunn remarked that these teachers "saw no inconsistency" in remaining in the shcools and "externally at least" accommodated themselves to the demands of the new organization.

Concerning some of the ambiguities to be found in the context of curriculum innovation, to quote Barry (1974) again, she remarked in her study of Engineering Craft Studies, that the introduction of any new syllabus in its early stages posed problems concerning the depth, the level and the method required to teach it; indeed there was ambiguity concerning the syllabus itself. However, it was our opinion that ambiguity in curriculum innovations probably went deeper; it was probably rooted in the lack of clarity about fundamental issues in curriculum theory and practice. As Owen (1973) has remarked, schools frequently had only a "rather vague statement of philosophy and of goals". Educational definitions, were often "fuzzy and conflicting" (MacDonald, 1965). The very "language" (Brügelmann, 1975) of curriculum innovators often seemed ambiguous. We were of the opinion that the theoretical constructs and "operational principles" inherent in curriculum theory and practice (Kliebard, 1974) combined with the educational principles derived from the parent "disciplines" of education (Peters, 1967) could well confuse a number of practising teachers. It seemed to us, for example, that a lot of ambiguity might surround such concepts as "integrated studies", "multi disciplinary studies" and "inter-disciplinary studies". To take another example, it was probably not an easy matter for teachers to discriminate between "student-centred learning", "discovery learning" and "learning by doing". It seems to us therefore that since curriculum innovation introduced new educational concepts, the processes of abstraction, discrimination and generalization for concept formation were probably just as important for the learning of these new educational concepts as for the learning of any other concept; hence for many teachers in order to avoid ambiguity, experience of similar and dissimilar exemplars of these new educational concepts was necessary although they (the teachers) were capable of "propositional thinking" (Piaget, 1958).

Gross and others (1971) have described the ambiguities that they found surrounding the implementation of the "new definition" of the elementary schoolteacher's role in Cambire, New England. This "new definition" viewed the teacher as assisting children to learn according to <u>their</u> interests throughout the day in self-contained classrooms. The teacher was henceforth expected to emphasise the <u>process</u> of learning, not its content. But as Gross and others found out, the administrators "held ambiguous views" of the innovation; they did not specify the types of role performance the teachers were to engage in, in order to obtain the "desired behaviour" from their pupils. On their part, the teachers did not have "a clear image" of the role performance expected of them; they had an "ambiguous notion" of what was expected and there was "confusion" about the innovation.

Grace (1972) has discussed the increased "diffuseness" (Wilson, 1962) in teachers' roles which innovations often entailed. He found some evidence of a radical reorientation of roles (in the direction of greater diffuseness) among teachers involved in innovation projects such as the "New Mathematics Project" and the "Nuffield Science Project". In many of these new developments, as Grace explained, the teacher was no longer the mediator of specific, predetermined knowledge to the pupils. There was often a move towards open learning situations and towards inter-disciplinary studies with the result of increasing diffuseness in the teacher's role.

The genesis of ambiguities in curriculum innovation was to be found elsewhere as well. Ferry (1974) has drawn attention to ambiguities about the role and status of teachers in pilot situations preceding the implementation of innovations. These ambiguities always loomed large. The teacher was caught between the danger of being either "the zealous" or "the resigned agent" of a project for which others took credit.

Lastly, perplexity could be expected to arise in the context of curriculum innovation when there was some evidence favouring each of a number of beliefs about the curriculum, but no way of knowing for certain which of the beliefs was true. Presumably a basic reason for innovation in a curriculum was that the new curriculum would prove to be the appropriate one and "better" than the existing one! Yet, to establish convincingly this superiority posed enormous problems of evaluation. In fact, Popham's (1975) review of the diverse collection of models of evaluation in education showed that it was difficult to obtain agreement on the very criteria of evaluation. In "goal-attainment models" of evaluation, for example, goals could not sometimes be clearly specified because of a lack of knowledge (Litwak, 1970); goals like "good citizenship" or "humanitarian man" fell into this category. In these cases, only the "grossest qualitative assessments" about goals could be made.

Moreover, most of the tools and techniques of evaluation that were available were developed for differentiating among individuals and not for measuring change or progress (Stake, 1967). For example, in traditional item development only items that discriminated best between individuals were retained, the others were rejected or revised; yet as Carver (1970) has commented, the very items that were thrown away were the ones that had the most potential for measuring change; that is, those items which almost everyone answered correctly at the end of a course might have been the very items that few answered correctly at the beginning of the course.

More recently, there has been the proposal by the "new-wave evaluators" (Stenhouse, 1975) that there could be many different evaluation designs serving different purposes (MacDonald and Parlett, 1973) even for a single educational programme. In addition, it is suggested that the value positions of the evaluators themselves should be made evident. Given that curriculum evaluation was such an indeterminate process, it seems to us that many teachers were bound to be perplexed at the rightness of new ideas and practices, specially when these were weighed against their own experience of success (at least in their eyes) with certain well-established ideas and practices.

Seemingly then, curriculum innovation was accompanied by a building up of uncertainty, arising from the complexity, incongruity, ambiguity and perplexity which often characterised curriculum development projects. Such uncertainty even if it was not so intense as to cause anguish as Schon described, could be expected to arouse teachers and stimulate them to react to the innovation in different ways. Thus, an increase in uncertainty could be an antidote to the "general boredom and repetitiveness" of school life (Jenkins,1972); it permitted teachers to identify themselves occupationally as innovators and opened up possibilities for "exotic career moves". Jenkins also thought that "institutionalised uncertainty" forced teachers to reconsider the way in which they were anchored to the perspectives and reference groups which had been of help to them in their teaching. On the other hand, our review of the relevant literature showed that often enough uncertainty led to resistance to change. Thus, quoting Owen (1973) again, he asserted that each time a teacher was uncertain about what faced him, he (the teacher) was "properly cautious" and that such caution either "looked like resistance" or "transformed itself into purposeful resistance". However, according to Holley (1974), when teachers had become FAMILIAR with change they became committed to regular and systematic change. It seemed to us therefore that an understanding of the dynamics of teachers' reactions to curriculum innovation required the study of the effects of the relevant psychological forces. Of these, DOGMATISM came readily to our mind as an important psychological mechanism because according to Rokeach (1960), the dogmatic mind was "extremely resistant to change".

But Rokeach's analysis of DOGMATISM rested on the postulated existence in man of two powerful and conflicting sets of motives: the need to know and understand and the need to ward off "threatening aspects of reality". The question that we asked ourselves therefore was how did these motives intervene in the moulding of teachers' attitudes to curriculum innovation, that is, in their decision to adopt (A_s) or reject it. Consequently, in the next section below we examined in a fundamental way the motivation of teachers in the context of curriculum innovation, acknowledging however, that of the many constructs that psychologists used, that of motivation was probably "the most controversial and least satisfactory" (Appley, 1970).

2.7 THE MOTIVATION OF TEACHERS TO ADOPT OR REJECT CURRICULUM INNOVATION

In order to comprehend teachers' motivation to accept or reject curriculum innovation we turned first to Hebb's (1955) seminal paper on arousal and motivation. Hebb argued that there was an optimum of arousal, below which an organism would be expected to seek stimulation and above which it would withdraw from stimulation. Expressed differently, the hedonic value of the stimulation depended on the level of arousal. However, according to Berlyne (1960; 1965; 1967), because certain properties of incoming stimuli (e.g. novelty, incongruity and complexity) had the potential to affect arousal, there was for an individual organism at a particular time, an optimum influx of arousal potential. Hunt (1963; 1972) developed this idea further, and by interpreting arousal potential as equivalent to "incongruity" in his (Hunt's) sense of the term, he argued that there was an <u>optimum of "incongruity"</u> which divided pleasant approach to stimulation from unpleasant withdrawal from it (see Appendix Q). Thus incongruous stimulus situations could sometimes be attractive and sometimes repelling.

In the present account of the development of teachers' attitudes towards curriculum innovation, we assumed that the stimulation created by changes in a complex "object" like curriculum innovation occasioned a fund of arousal and that the degree of "arousal potential" or "incongruity" was largely inherent in the characteristics of the stimulation. We borrowed from Berlyne and from Hunt the concept of an optimum of arousal potential or "incongruity" for each individual teacher, a threshold which, if crossed, caused aversion to the stimulation. This aversion manifested itself in avoidance and defensive reactions.

But although hedonic considerations entered into the evaluation of an innovation, it was not to be assumed that unpleasantness could not be enjoyable. Many people enjoyed the painful and the terrifying. However, as Barnett (1953) has written concerning cultural change, fear was the "ultimate reference" in the antipathies that were observed when innovations were introduced into a culture. For example, pieces of complex machinery were terrifying to uninitiated individuals, especially to those who believed that they were too old to learn to master the controls of such machinery. Our own proposition was that some curriculum innovations were just like complex pieces of machinery and consequently just as terrifying for some teachers!

However, our main contention was that when studying conflict which was mostly conceptual in nature rather than perceptual, and when studying conflict in human beings (as distinct from other organisms) insufficient cognizance had been taken, by researchers, of the individual's PERSONALITY and in particular of the RESISTANCE within his PERSONALITY to change. As we have already indicated, one form of such RESISTANCE-within-PERSONALITY was DOGMATISM (Rokeach, 1960) and consequently we examined its effect on the teachers' reactions to curriculum innovation first. Later, we turned to other possible forms. (See Section 2.11.)

2.8 THE EFFECT OF DOGMATISM ON THE MOTIVATION OF TEACHERS IN THE CONTEXT OF CURRICULUM INNOVATION

Rokeach (1960; 1968) conceived of all belief systems as having three major dimensions: a Belief - Disbelief dimension, a Central-Peripheral dimension, and a Time-Perspective dimension. He conceptualised the "coding and processing" of new information input into the belief system as beginning with the screening of the new information for compatibility with "primitive" and "intermediate" beliefs along the central-peripheral dimension. This initial screening could lead to the rejection of the new information or else to the information being altered and then filed and communicated to the peripheral region where it became represented in its psychological form as a belief or disbelief.

High "Dogmatic" individuals were characterised by a closed system, that is, one which was left intact when receiving new information although the new information itself was tampered with, for example, by narrowing it out, altering it, or containing it within isolated bounds. On the other hand, for "low dogmatic" or "open" individuals, the new information was assimilated "as is". It communicated with other peripheral beliefs and in this way, made possible genuine changes in the whole system.

But Rokeach went beyond the analysis and description of belief-disbelief systems to an explanation of Dogmatism couched in psycho-analytic terms. He saw the highly dogmatic person as largely unable to receive, evaluate, and act on relevant information on its own merits, in accordance with "the inner structual requirements" of the situation and "unencumbered by irrelevant internal or external factors". Examples of these irrelevant external factors were the person's reference groups, the socio-cultural and institutional norms, and authority figures. An example of irrelevant internal factors was the need to allay anxiety as in the case of uncertainty.

The effect of this interference of internal and external factors was to trigger off a defence mechanism. This mechanism consisted in erecting a psychological barrier which shut off the highly dogmatic individual from new input of information coming from the stimulation. The way in which this defence mechanism in humans might operate jointly with conceptual conflict to give direction to individual responses to change did not seem to have received a great deal of attention in the relevant literature. We therefore made an analysis of this joint operation in Appendix Q.

In this analysis we examined the joint effects of "incongruity" and of DOGMATISM on the level of arousal in two cases: firstly when incongruity was superoptimal and secondly when it was supraoptimal. We assumed that for the less Dogmatic individuals, "incongruity" was reduced because they were "open" to new information, whereas for the more Dogmatic individuals, there was little reduction in "incongruity", because they were "closed to information" (Long and Ziller, 1965). It followed that for the less Dogmatic individuals, there was a relatively large reduction in the level of arousal and consequently a relatively large gain in the hedonic value of the innovation. On the other hand, for the more Dogmatic individuals, there was relatively little reduction in the level of arousal and relatively little gain in the hedonic value of the innovation.

2.9 THE JOINT EFFECTS OF DOGMATISM AND FAMILIARITY ON THE MOTIVATION OF TEACHERS IN THE CONTEXT OF CURRICULUM INNOVATION

From these foregoing paragraphs then, it seemed that we should expect that on average the less Dogmatic among the teachers would tend to favour curriculum innovation whilst the more Dogmatic would not. But our analysis did not take into consideration the different conditions under which teachers were exposed to new information; that is, whether the new information (the innovation) was forced on them by those in authority over them or whether it was obtained from individual choice. The contrast between these two conditions was all-important because when a particular curriculum innovation was imposed on teachers, as might be the case in schools and colleges which were organized on highly formal lines, even the more Dogmatic individuals amongst the teachers were exposed to the innovation and had to implement it - or quit! Consequently, willy-nilly, these Dogmatic teachers also became FAMILIAR with the innovation. The question then was to what extent increasing FAMILIARITY with the innovation and the diminishing uncertainty about innovation which in all probability accompanied such FAMILIARITY helped to increase the hedonic value of the innovation. We decided to examine this question before continuing with our discussion of the relationships between forms of RESISTANCE-within-PERSONALITY and teachers' attitudes to curriculum innovation.

But what exactly was meant by FAMILIARITY with curriculum innovation? Bhola (1965) has rightly said that the "FAMILIARITY-UNFAMILIARITY" dimension was certainly not so simple! We ourselves found that in thinking about the meaning of the term we tended to drift into philosophical speculations about the nature of experience, of awareness and of knowledge.

One difficulty too in thinking about FAMILIARITY with regard to a complex "object" like curriculum innovation was that although the "object" taken as a whole was a novelty and therefore unfamiliar to teachers, parts of it might not be so. Teachers' FAMILIARITY with a particular curriculum innovation had consequently to be thought of in terms of FAMILIARITY with parts of the innovation rather than with the whole of it, although the teachers' reactions to the innovation were probably in terms of the whole rather than in terms of the parts, according to Gestalt Psychology. And for a <u>specific</u> curriculum innovation there was the real possibility too that for some teachers the subject matter itself was familiar enough to them whilst the proposed method of teaching it was new. We had therefore to distinguish between FAMILIARITY with the subject matter and FAMILIARITY with the teaching of the subject in the newly introduced curriculum.

Accepting then that FAMILIARITY was not a unitary concept, we chose in the present study to put relatively greater emphasis on the extent to which teachers <u>used</u> parts of the support materials which were usually produced when a particular curriculum innovation was launched. FAMILIARITY then was conceived in terms of the extent to which teachers actually <u>used</u> innovative support materials to teach their subjects. Having conceptualised FAMILIARITY in this way we thought of dividing those teachers who were familiar with a specific curriculum innovation into two categories: the "Quite Familiar" category and the "Very Familiar" category. The first category was for those teachers who had <u>used</u> some parts or sections of the Support materials developed for the curriculum innovation; the second category was for those teachers who had used most (if not all) of the parts or sections of the Support materials. For teachers who were <u>NOT FAMILIAR</u> with the particular innovation, their <u>UNFAMILIARITY</u> (or NON-FAMILIARITY) was also divided into two categories. These were the "Very Unfamiliar" and "Quite Unfamiliar" Categories. The former applied to those who had never seen the innovative materials or did not know anything about them; they had never <u>used</u> the materials and were not at all familiar with them. The latter category applied to those who might have had some knowledge of the materials and were therefore somewhat familiar with these materials but had never actually <u>used</u> the materials in their teaching. Such knowledge as they had about the specific curriculum innovation would have come through, for example, <u>Attending a Course</u> or discussing the materials with colleagues. Operationally then, a teacher's FAMILIARITY was defined by the category to which he belonged on the Unfamiliarity (or Non-familiarity)-Familiarity continuum.

Returning now to the part played by FAMILIARITY in the development of teachers' attitudes to curriculum innovation in "formal organizations", we assumed that attitudes had the status of HABITS (Eysenck, 1954; 1957), that is, they were stimulus-response bonds built up through reinforcement as in Hull's (1943) theory. Now, according to Hull, increments in habit strength from successive reinforcements of responses summated in such a way that the habit strength was a simple positive growth function of the number of reinforcements. This type of function was commonly observed in learning experiments and indeed for biological growth in general. In other words, as we have already indicated, the underlying assumption was that attitudes to curriculum innovation were learnt. The curves in Figure 2.5 were typical learning curves except that degrees of FAMILIARITY replaced number of reinforcements on the abscissa and strength of attitude replaced habit strength on the ordinate (see Appendix Q). The different gradients of the curves reflected the respective effects of different levels of Dogmatism.

As for the joint effects of FAMILIARITY and Dogmatism on the motivation of teachers in the context of curriculum innovation, we assumed that an increase in positive attitude towards curriculum innovation, that is, in the hedonic value of the innovation, corresponded to a decrease in the level of arousal; consequently, we obtained the curves drawn in Figure 2.6. These showed the differences to be expected in the average levels of arousal for two groups of teachers as a result of FAMILIARITY with curriculum innovation; one group characterised by a HIGH level of Dogmatism and the other by a LOW level of Dogmatism. Differences in the momentary orientation reactions between the HIGH Dogmatics and the LOW Dogmatics were assumed to be negligible and hence the curves showed an initial steep rise to a common point B. It was also assumed that until such time as teachers actually used the innovative curriculum materials the level of arousal would not be greatly abated. But when they did start to use the materials there resulted a rapid reduction in the level of drive or arousal. However, the contrast between the effect of a HIGH level of Dogmatism and that of a LOW level when curriculum innovation was mandatory, was seen in

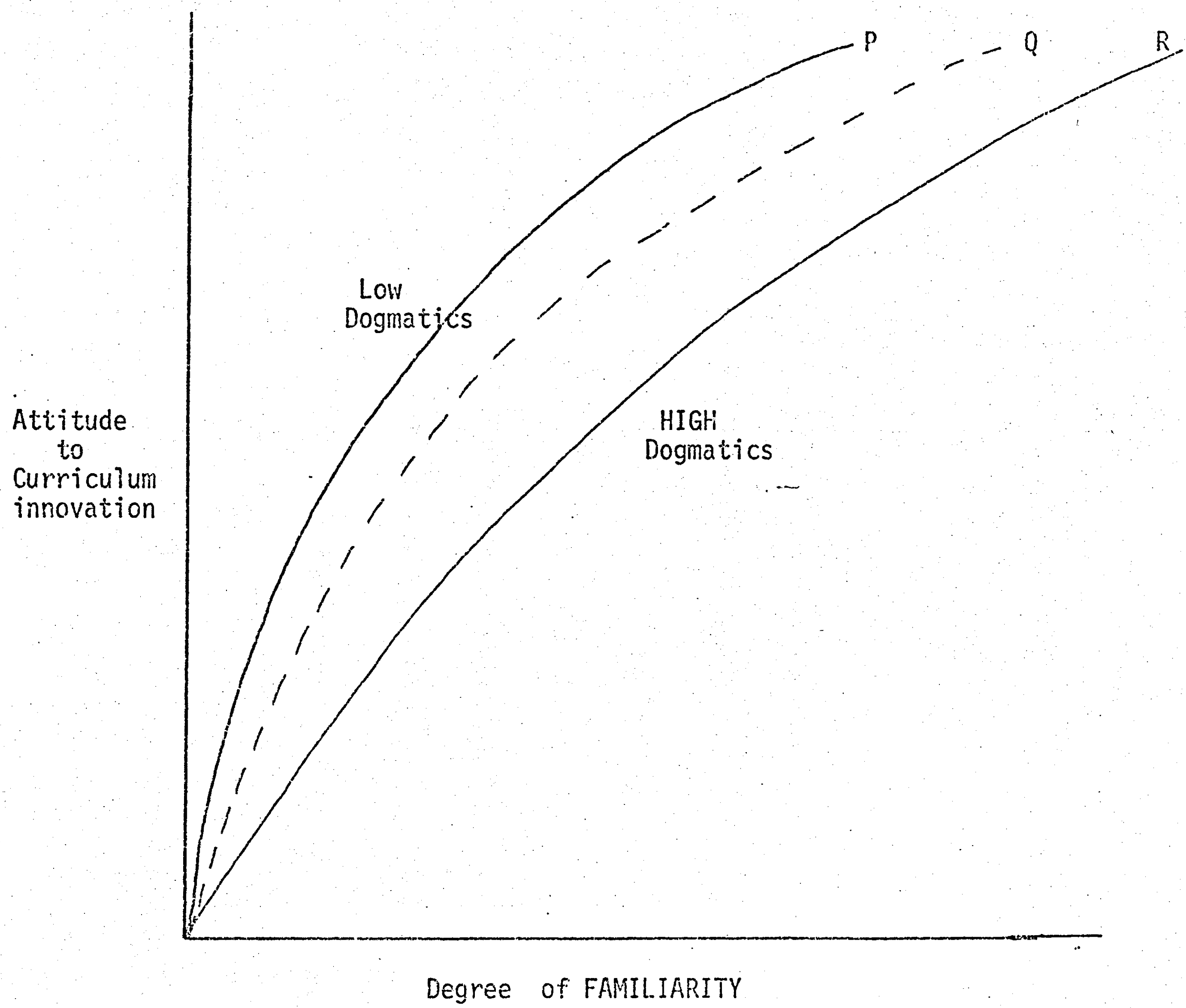
FIGURE 2.5

POSTULATED DEVELOPMENT OF ATTITUDES TO CURRICULUM INNOVATION WITH INCREASING FAMILIARITY FOR A GROUP OF HIGH DOGMATIC TEACHERS AND FOR A GROUP OF LOW DOGMATIC TEACHERS WHEN CURRICULUM INNOVATION WAS IMPOSED BY AUTHORITY

OP = curve for the average growth in attitude for the LOW Dogmatics

OR = curve for the average growth in attitude for the HIGH Dogmatics

OQ = Curve for the average growth in attitude for a combined group of HIGH and LOW Dogmatics (in approximately equal numbers)

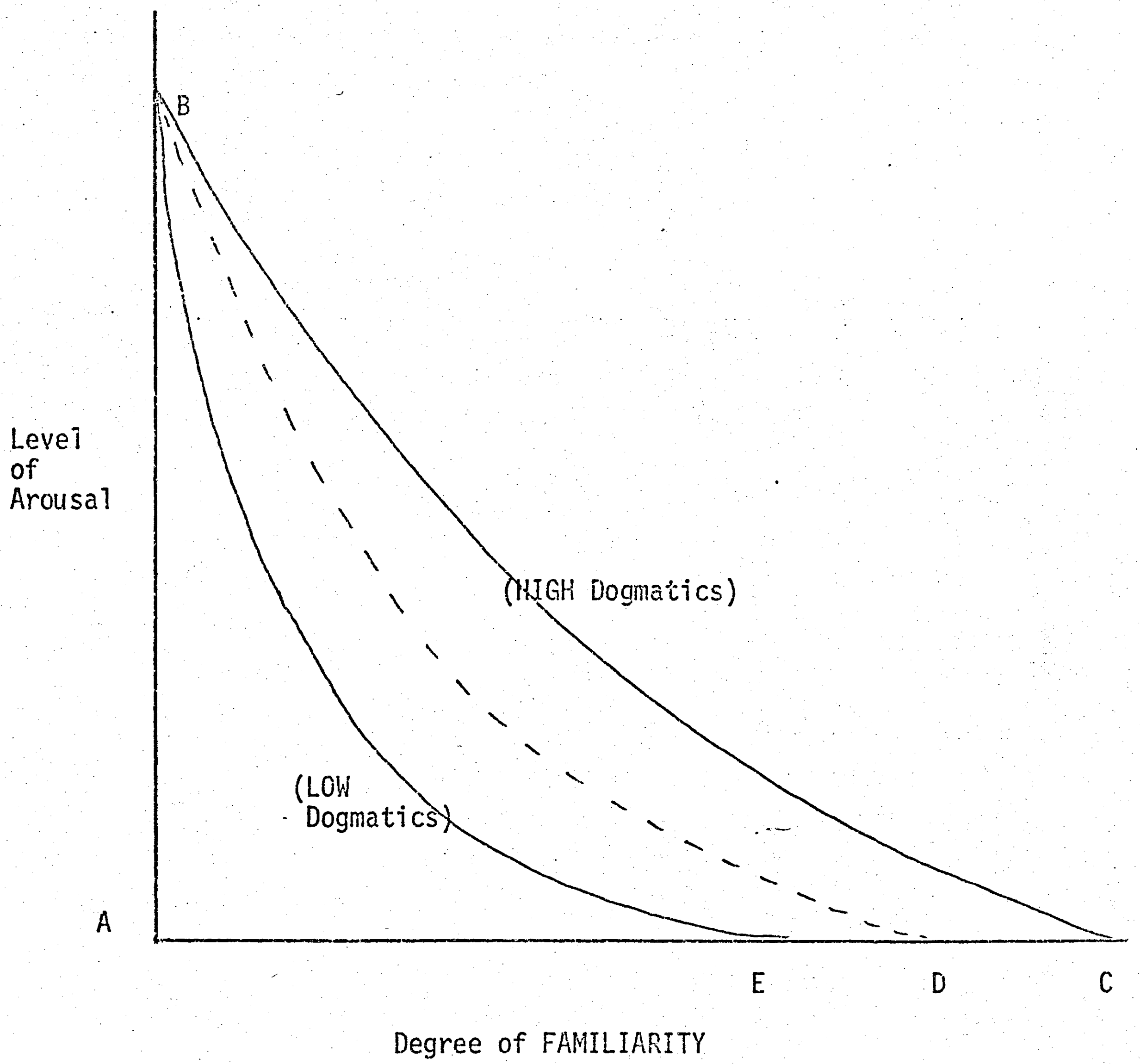


the subsequent, relatively higher rate of drive reduction (or lessening of arousal) among the LOW Dogmatics (Curve BE) than among the HIGH Dogmatics (Curve BC). We proposed that when new information about curriculum innovation was received by HIGH Dogmatics in a formal organization, it was accommodated within their belief-disbelief systems but only very gradually. If this were so, we should expect to find significant differences between groups of HIGH and LOW Dogmatics in their levels of arousal and in their attitudes to curriculum innovation, when these two groups were equally FAMILIAR with the innovation and when the degree of FAMILIARITY was not too high or too low. (Figures 2.5 and 2.6.) Consequently, the relevance of this discussion for our purpose was that Dogmatism should correlate significantly and negatively with the measures of teachers' attitudes to curriculum innovation when FAMILIARITY was controlled over a certain range of values. For <u>each</u> such measure of attitudes, the correlation squared would give us the proportion of the variance in the teachers' attitudes which was explained by Dogmatism.

However, as we mentioned above, theory also suggested that "authority figures" were among the "irrelevant factors" which according to Rokeach prevented the HIGH Dogmatics from evaluating new information on its own merits. And consequently, in formal organizations, HIGH Dogmatics (because of their arbitrary and absolute reliance on authority) could be expected to undergo a "party-line" change and readily adopt (in both senses of the term, A_o and A_s) the innovation which was forced upon them. If such a change occurred to an appreciable extent, the differences in attitudes to curriculum innovation between the HIGH Dogmatic teachers and the LOW Dogmatic teachers could be considerably

FIGURE 2.6

THE POSTULATED DROPS IN AVERAGE LEVELS OF AROUSAL WITH INCREASING FAMILIARITY FOR A GROUP OF HIGH DOGMATIC TEACHERS AND A GROUP OF LOW DOGMATIC TEACHERS WHEN CURRICULUM INNOVATION WAS IMPOSED BY AUTHORITY



BE = curve for the drop in average level of arousal for the group of LOW Dogmatics

BC = curve for the drop in average level of arousal for the group of HIGH Dogmatics

BD = curve for the drop in average level of arousal for a combined group of HIGH and LOW Dogmatics in approximately equal numbers

A = the optimum level of arousal

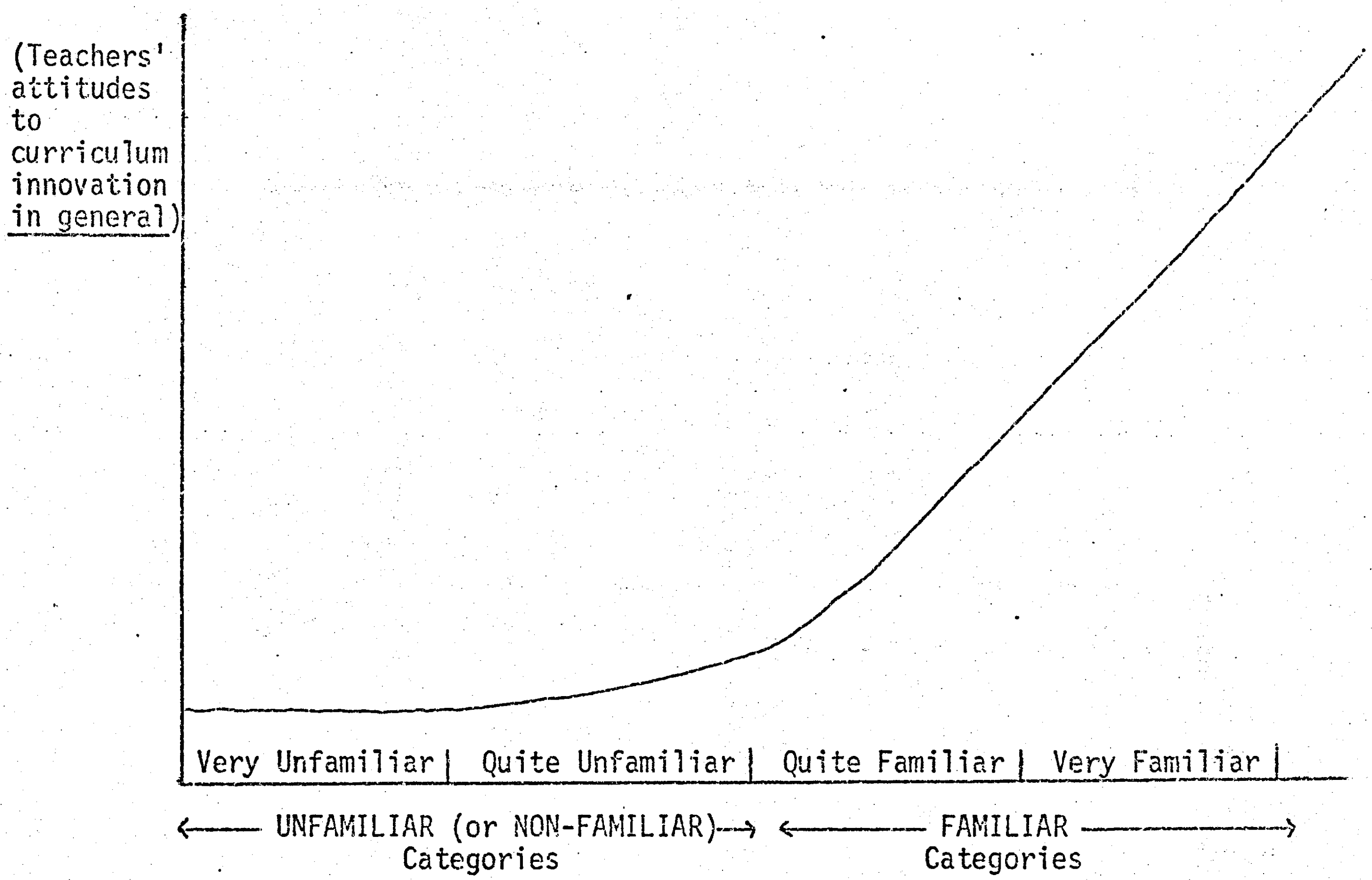
reduced and the expected correlations between Dogmatism and each of the measures of teachers' attitudes drastically lowered. But it was probably unlikely that such a "party-line" change would take place to the same extent for all the measures of teachers' attitudes to curriculum innovation. The size of the correlations would consequently vary for different measures of attitudes.

Turning now to an examination of FAMILIARITY effects on teachers' attitudes to curriculum innovation when Dogmatism in its turn was controlled or partialled out, it was apparent from Figure 2.5 that for both curves, that is, for the HIGH and the LOW Dogmatics alike, the larger the difference in the degree of FAMILIARITY, the greater was the difference in the teachers' attitudes likely to be. It seemed then that we might expect the teachers' attitudes to co-vary to some extent with their degrees of FAMILIARITY. However, the gradients of the curves in Figures 2.5 and 2.6 were an important consideration. If the rate at which positive attitudes towards a particular curriculum innovation developed was so slow that the gradients were very small, the FAMILIARITY effects as observed by differences in teachers' attitudes could be hardly noticeable after only a short period of familiarisation with the curriculum innovation. If, however, the teachers' attitudes were measured after a prolonged period of familiarisation, and if there were no reversal effects on these attitudes, significant differences in attitudes could be detected.

Now, at the risk of stating the obvious, the relationship between teachers' attitudes to a specific curriculum innovation and their FAMILIARITY with that innovation could only be investigated within groups of teachers who were already FAMILIAR with the innovation, (in the sense that FAMILIARITY has been defined). An investigation of this relationship could not be undertaken for groups of teachers who were "Unfamiliar" with the curriculum innovation because these teachers could not have developed attitudes towards a specific curriculum innovation if they knew nothing about it. However, it could be assumed that many teachers in England and to a lesser extent in India had had in recent years some second-hand experiences of curriculum development projects. Inevitably, therefore, as a result of such experiences they had formed opinions about the idea and practice of curriculum innovation in general, that is, not simply about the specific innovative curriculum materials with which they had come into contact, but also about the general conditions that seemed to facilitate or inhibit the successful institutionalization of curriculum innovations within their own subjects. Our proposition was that the development of favourable attitudes towards curriculum innovation in general increased sharply when those "Unfamiliar" teachers became themselves actively involved with a specific curriculum innovation, that is, when they got experience of curriculum innovation at first-hand. Figure 2.7 illustrated this point. It portrayed the postulated relationship between teachers' FAMILIARITY with a specific curriculum innovation and their attitudes to curriculum innovation in general. For the sake of clarity, separate curves were not drawn for groups of HIGH Dogmatics and LOW Dogmatics respectively. If our proposition was correct we could expect to observe significant differences in teachers' attitudes to curriculum innovation in general between teachers who were FAMILIAR ("Quite familiar" or "Very familiar") with a specific curriculum innovation and teachers who were NOT FAMILIAR ("Quite Unfamiliar" or "Very Unfamiliar") with the

FIGURE 2.7

PROPOSED GRAPH OF TEACHERS' ATTITUDES TO CURRICULUM INNOVATION IN GENERAL AS A FUNCTION OF FAMILIARITY WITH A SPECIFIC CURRICULUM INNOVATION



(Teachers' FAMILIARITY with a specific curriculum innovation)

Note

The postulated curve was for a combined group of HIGH and LOW Dogmatics (in approximately equal numbers) innovation.

This proposition was important in relation to our empirical work as we described later (see Chapter 4). It meant that it was a legitimate procedure to ask teachers with very limited FAMILIARITY or NO FAMILIARITY with the specific curriculum innovation in Engineering Drawing in India, (that is, teachers in the states of Mysore, Kerala and Andhra Pradesh) for their reactions to certain aspects of curriculum innovation in general. The reactions of those teachers could be expected to be different from the reactions of teachers in TAMIL NADU who were FAMILIAR with the specific innovation in Engineering Drawing and the relationship between FAMILIARITY (with that specific curriculum innovation) and attitudes to curriculum innovation in general could then be studied.

2.10 THE EFFECT OF ATTENDANCE ON COURSES ON THE MOTIVATION OF TEACHERS IN THE CONTEXT OF CURRICULUM INNOVATION

It was to be expected that FAMILIARITY (when conceived in terms of the use that teachers made of the innovative materials which accompanied a specific curriculum innovation) imparted a certain KNOWLEDGE of that innovation. But FAMILIARITY in that sense was not the only means available for acquiring KNOWLEDGE of the innovation. As Appendix A shows, the CRASH COURSES for the teachers in India aimed at training their course members specifically in the use of the innovative curriculum materials. They aimed at explaining the theoretical rationale for the curriculum innovation in terms of the innovative educational ideas underlying it. In addition, a number of "sessions" were designed to give practice in acquiring a number of skills such as the skills of writing objectives for specified topics, of constructing objective-type tests and of preparing "Lesson Plans", to name but a few. In this way, each CRASH Course imparted a degree of KNOWLEDGE about the specific innovation to the teachers who attended it. However, it was KNOWLEDGE obtained in a somewhat different way from that obtained through familiarisation with the innovative curriculum materials by actually using these materials, in class, in one's teaching. Probably the main difference was that there was no immediate feedback to the teachers about their own classroom behaviours in an innovative context. Another difference was that in all probability such a COURSE emphasised KNOWLEDGE of theories and principles whereas FAMILIARITY (in our sense of the term) tended to give KNOWLEDGE of specifics, to use Bloom's (1956) distinction between these two kinds of KNOWLEDGE.

It was postulated that Attendance on an In-Service COURSE of training for a specific innovation would make a difference to the attitudes of teachers who had to implement the innovation in much the same way that FAMILIARITY did. However, on its own, that is without the implementation of innovation and therefore without "knowledge of results" and continuous "reinforcement" of learning, a COURSE might not achieve much; it might not enhance the positive hedonic value of the innovation (after the initial "orientation reaction" had subsided) to a very great extent. Enhancement in positive hedonic value was probably greatest when Attendance on a Course went hand in hand with FAMILIARITY with the innovation.

2.11 FORMS OF RESISTANCE-WITHIN-PERSONALITY

Returning now to the notion of RESISTANCE-within-PERSONALITY, since the present study located a mainspring of resistance to change within the personality (Huberman, 1973; Johns, 1973) the question was: how much of the variance in the teachers' attitudes to curriculum innovation could be explained by various forms of RESISTANCE-within-PERSONALITY?

The topic of RESISTANCE-within-PERSONALITY was well covered in the psychological literature. Thus, Watson (1966) described the "forces of resistance" in personality, (such as habit and perceptual selectivity) whilst Guskin (1971) listed the personal or "individual variables" (such as sense of competence) which intervened in the utilization of knowledge. However, it seemed to us that some of these "forces" and "variables" were much the same psychological factors and mechanisms implied in Rokeach's description of the processing of new information by the Dogmatic personality. Watson's "selective perception and retention" was a reference to the tendency to admit (as in closemindedness) only such new ideas as fitted one's established outlook, thereby blocking out new information. The "feelings of threat" to one's "sense of competence" and the fear engendered by change which Guskin described, were reminiscent of the constellation of conditions which, according to Rokeach, made a person susceptible to "cognitive confusion" between information and source of information, and therefore prone to closemindedness. Harvey's (1967) dimension of concreteness - abstractness for conceptual systems paralleled Rokeach's continuum of closemindedness - openmindedness although, according to Schroder (1967), the Dogmatism scale was not as good an indicator of concreteness as the Authoritarian Scale (Adorno, 1950).

Rigidity too, was a concept which was commonly linked with RESISTANCE-within-PERSONALITY. Admittedly, as Chown (1959) has suggested, it was a "flexible concept"! and various researchers have studied its many facets. Cattell (1935) has labelled as "Rigidity" the perceptual behaviour which was observed by Spearman (1927) and which consisted of perseveration from one simple repetitive motor task to another. Cattell's (1949) factor analytic study of Rigidity yielded in addition a factor of inability to learn from gradually changing stimuli. For Gough and Sanford (1952), "inflexibility of thought and manner" and "resistance to change" were basic conceptions underlying their Rigidity Scale. Fisher thought that Rigidity was a kind of restriction on the individual's perceptual intake as a defence against ego-involving situations which the individual found threatening (Fisher, 1950; Leach, 1967). Frenkel-Brunswick (1949; 1954) explained why rigidity was the chosen mode of defence. She found that rigid children had authoritarian parents and argued that such parents made demands on their children for behaviours which could not be understood or achieved. As a consequence, these children learned to subdue libidinal impulses rather than to control and channel these impulses. They learnt to subdue without comprehension and to be obedient to external demands rather than to internalized standards. As a result of this lack of internalization of values these children when faced with ambiguity felt threatened and had recourse to Rigidity as a defence mechanism.

Rokeach (1954; 1955; 1956; 1960) made an important theoretical and legitimate distinction between Dogmatism and Rigidity. According to Rokeach, Dogmatism represented a "relatively more intellectualized, abstract form" of resistance to change than Rigidity. Dogmatism referred to the total cognitive organization of ideas and beliefs into a relatively closed ideological system whereas Rigidity, when conceived phenotypically, was defined in terms of the way a person or an animal attacked, solved or learned specific tasks and problems. Thus, Dogmatism was seen as a "higher-order" and more complexly organized form of resistance to change. Furthermore, Dogmatism related to the difficulty experienced in integrating or synthesising new sets of beliefs into new cognitive organizations after older sets had been overcome; on the other hand, Rigidity involved the overcoming of specific sets of beliefs. Thus, according to Rokeach, rigid thinking was characterised by the inability to analyse and break down beliefs when these were no longer appropriate in order to replace them with more appropriate beliefs.

2.12 PERSONALITY STRUCTURE AND RESISTANCE-WITHIN-PERSONALITY

Given the multiplicity of forms of RESISTANCE-within-PERSONALITY, our own research strategy was to derive measures of RESISTANCE-within-PERSONALITY which were related to Dogmatism and Rigidity but which were at the same time anchored to more basic dimensions of personality, namely those identified by Eysenck (1947(a); 1970(a)) as Extraversion(E) and Neuroticism(N). The reason for this was that an important criticism of Rogers' (1957) study of the personality correlates of the adoption of technological practices by Harp (1960) was that it was not obvious that the measures of personality used by Rogers (such as Dogmatism, Rigidity and Innovative Proneness) were related to "basic personality structures". Unfortunately, Harp himself did not explain his notion of "basic personality structures". But it seemed to us that Eysenck's theory of personality provided us with a possible description of "basic personality structures". For Eysenck had concluded that the results from different universes of discourse and from many "apparently separate and independent sets of investigations", all supported very strongly the thesis that two orthogonal personality factors, Extraversion-Intraversion(E) and Neuroticism-Stability(N), were "omnipresent" in the empirical studies and analyses that had been done.

The basic structure of human personality that presented itself to us then was one which rested on these two personality dimensions. The structure was basic in the sense that when personality was conceived in terms of dimensions, Extraversion and Neuroticism were the two largest and most commonly found dimensions, and accounted for a large portion of the total variance in personality. Cattell (1973) has contended that Eysenck's factors emerged because of "gross underfactoring". But according to Klein (1976), Cattell's second-order factors "exvia" and "anxiety" were "virtually the same" as Eysenck's factors of Extraversion and Neuroticism respectively, as indeed Eysenck had endeavoured to demonstrate (Eysenck and Eysenck, 1969). Guilford's (1959) personality factors as well as Comrey's (1970) personality factors seemed to overlap a great deal with Cattell's factors (Cattell and Gibbons, 1968; Cattell, 1973). But the structure of personality described by Eysenck was basic in yet another important sense. It was anchored in physiological and neurological reaction mechanisms and was rooted in Hull's (1943) principles of behaviour.

2.13 THEORETICAL RELATIONSHIPS BETWEEN RESISTANCE-WITHIN-PERSONALITY AND TEACHERS' ATTITUDES TO CURRICULUM INNOVATION

This link with the Hullian system enabled us to attempt a discussion of the possible relationships between teachers' attitudes to curriculum innovation and RESISTANCE-within-PERSONALITY which was anchored to Neuroticism and Extraversion. For we could assume as Eysenck did in his behaviour system, and as we have already done, that attitudes to curriculum innovation had the status of HABITS (Eysenck, 1954; 1957); they were in Hull's theory, stimulus-response connections developed through a number of reinforced repetitions and were therefore related to the personality dimensions of Conditionability (Extraversion) and of Emotionality (Neuroticism). Of course, Eysenck's theory had many ramifications which were not directly relevant to the present study. However, part of our concern in the present study was with the learning of new attitudes to the curriculum; in other words, we were concerned with the formation of new habits, and therefore, with HABIT STRENGTH ($_{S}H_{R}$) in Hullian terminology. But, at the same time, we were also concerned with the evocation of the existing attitudes which teachers had developed to a particular curriculum as a result of their teaching experience and of their own forumulations of curriculum theory and practice. Furthermore, there was the evocation of learned patterns of defensive reactions such as the Dogmatic reaction in threatening situations.

Now, in terms of Hull's theory, the reaction potential ($_{S}E_{R}$) for old habits (that is, for attitudes towards well-established curricula and for well-established defensive reactions) was a multiplicative function of the "strength" of these attitudes and reactions and of the amount of "drive". The question then was what was the "drive" in the context of curriculum innovation? This question took us back to the argument that the very complexity of curriculum innovation tended to bring with it a degree of uncertainty about its purpose, its methods and its outcomes, and that for a number of teachers the threat which such innovations presented to their professional identities was a source of considerable anxiety. Individuals who perceived curriculum innovation as threatening responded to it with an elevation in anxiety because of their own idiosyncratic perceptions of the innovation irrespective of the presence or absence of any real, objective, danger. And the interesting point was that anxiety had the qualities of a "drive" (Mowrer, 1939); indeed, it was a "very relevant drive" in complex learning situations (Eysenck, 1957). We ourselves assumed that it was a strong "drive" in the context of curriculum innovation. In addition, we assumed that attitudes to well-established curricula and well-established defensive reactions were strong "habits" so that the probability that these learned responses would be evoked in the context of curriculum innovation was very great indeed.

However, individuals differed in levels of Emotionality (or Neuroticism); that is, emotional arousability was greater in some individuals than in others, and Emotionality (or Neuroticism) produced stronger than average drive in emotion - producing situations. Kogan and Wallach (1964) have found that for subjects high in emotionality it was difficult for faulty habit patterns to be changed; behaviours having high habit strength were preserved in spite of their inefficiency. If then curriculum innovation stimulated anxiety reactions and provoked strong emotions, there would be a tendency among the highly emotional teachers (i.e. those high in Neuroticism) to emit habitual responses to curriculum design and content. In fact, Morrison and Romser (1967a) have found that highly anxious individuals tended to believe in "traditional" classroom control.

Admittedly, it was conceivable that the more imaginative among the neurotic teachers would have anticipated on their own the innovative ideas that were introduced in a particular curriculum innovation. For these teachers, their habitual responses to curriculum theory and practice would probably be in line with the innovative ideas that they were asked to espouse. But it was assumed that probably only a few neurotic teachers were in that category. The suggestion was that for most of the neurotic teachers, increased anxiety (or "drive") was deleterious in that their habitual responses were antagonistic to the new ideas embodied in the curriculum innovation. The stronger tendency to respond with their existing well-established attitudes to the curriculum and to reject innovative ideas gained relatively more in reaction potential and had an enhanced probability of evocation over the newly formed attitudes towards the innovation. The new responses were low in the habit - family hierarchy and their response strengths were low. Thus, it seemed that too strong a drive was probably not efficient in motivating new responses to a complex "object" like curriculum innovation.

This line of reasoning led us therefore to postulate that amongst teachers a HIGH level of Neuroticism (HN) was likely to be associated with a negative attitude to curriculum innovation, and conversely, a LOW level of Neuroticism (LN) was likely to be associated with a positive attitude.

But so far we have used the terms Neuroticism and Anxiety as if they were synonymous. This was not so. The contemporary view of Anxiety (Lynn, 1971; Gaudry, 1971) was indeed that it was a kind of scale rather like height, weight and intelligence which everyone had to a greater or lesser extent and on which Neurotics scored at the high end. But, according to Lynn, although Neuroticism was "very much the same" as Anxiety it was by no means completely identical with it.

Thus, although Taylor's (1953) Manifest Anxiety Scale (MAS) was a good measure of Neuroticism it also correlated to some extent with Introversion (Franks, 1956). However, Eysenck (1957) has suggested that in connection with complex learning tasks the relevant portion of the variance in Anxiety (as measured by the Manifest Anxiety Scale) was that related to Neuroticism rather than that related to Introversion/ Extraversion. It followed that the postulated correlations between teachers' levels of Neuroticism and their attitudes to curriculum innovation mirrored to a considerable extent, but not completely, the relationships between their Anxiety states and these attitudes.

However, the <u>learning</u> of <u>new</u> attitudes to <u>new</u> curricula, that is, the forging of new stimulus - response connections (new HABITS) could depend on the Conditionability (or Extraversion) of individuals. Eysenck (1967) has in fact identified differences in behaviour related to Conditionability (or Extraversion) with differential thresholds in the various parts of the ascending reticular activating system and differences in behaviour related to Neuroticism with differential thresholds of arousal in the visceral brain. There was a fundamental functional difference between these two physiological structures although they were not completely independent of each other. According to Eysenck (1967; 1970(a)), the former of the two structures, the cortico-reticular loop, was concerned with information processing; it was responsible for cortical arousal. This state of arousal was higher in introverts than in extraverts, and <u>under non-emotion producing conditions</u>, introverts were in a state of relatively high cortical arousal (as compared with ambiverts) while extraverts were in a state of relatively low arousal and higher level of inhibition. This "cortical supremacy" in introverts produced a constraint on their behaviour. They were less impulsive and more conscientious. They were more likely to be influenced by social and institutional codes of behaviour.

Now, if we assume (as we have already done) that, generally speaking, subject departments in secondary schools, technical colleges and Polytechnics were formal organizations functioning according to fairly rigid normative régimes, then, in the case of a particular curriculum innovation that was institutionalized, those teachers who were introverted were more likely than their extraverted colleagues to accept the innovation and to internalize the new curriculum ideas. The cortical excitation that characterised introverts endowed them with a greater capacity for sustained work such as was necessary when introducing and implementing curriculum innovation. They were likely to accumulate reactive inhibition more slowly than extraverts. Moreover, it was known that introverts preferred the complex (Eysenck, 1954) and extraverts the simple; and since the assumption in the present study was that curriculum innovation was a complex "object", the introverted teachers could be expected to find curriculum innovation more attractive than the extraverted teachers. However, it could also be argued that the very intensity of stimulation offered by the complexity of curriculum innovation could put introverted teachers at a disadvantage because the evoked potential of learnt defensive reactions would be high (specially among those introverts who were Neurotic as well) and these defensive reactions would manifest themselves in a preference for well-established curricula.

But that was not all. If we assumed that curriculum innovation elicited strong emotions in teachers, there was yet another factor to be considered. With strong emotions the sympathetic system was "thrown into action" and, according to Eysenck (1970(a)), when this happened cortical arousal was "produced automatically" and individual differences between extraverts and introverts in respect to arousal were "largely washed out". This meant that for the neurotic teachers (that is, for those teachers who scored high on Eysenck's Neuroticism scale) there would be no differences between extraverts and introverts in their attitudes to curriculum innovation. As for the Stable teachers (that it, those who scored low on the Neuroticism Scale) although differences between the extraverts and the introverts among them were perhaps not completely "washed out", these differences would presumably be reduced.

The literature on the relationships between PERSONALITY and a radical attitude to education amongst teachers provided another basis for discussing possible relationships between teachers' levels of Extraversion and their attitudes to curriculum innovation. Thus, in England, McLeish (1969) obtained a non-significant correlation of only 0.08 between Extraversion and Radicalism in education. He used a version of the Maudsley Personality Inventory (Eysenck, 1969) with a heterogeneous sample of British, Commonwealth and American teachers (n = 581). In America, Morrison and Romoser (1967b) obtained a non-significant correlation of 0.10 between Extraversion and teachers' attitudes to modern beliefs about child control. The sample (n = 110) consisted of juniors, seniors and graduate students in a university department of education and psychology. It seemed then that Extraversion was not likely to be a correlate of teachers' attitudes to curriculum innovation.

However, near-zero correlations could be due to curvilinear relationships; and because of the possible interaction between Neuroticism and Extraversion, Eysenck himself (1970(a)) has suggested that the appropriate method for studying relationships between his personality dimensions (N and E) and some criterion variable was "zone analysis" (Furneaux, 1961). This kind of analysis allowed one to uncover non-linear trends in these relationships. It was based on the hypothesis that various combinations of personality traits (e.g. Neurotic Extraverts (HN-E) and Stable Introverts (LN-I)) produced different types of behaviour so that if the scores for a particular sample and for a particular criterion variable were allocated to the different zones, any differences in the mean scores for the different zones would become evident. Thus, in the present study, if a sample of teachers were divided into four groups by PERSONALITY corresponding to four zones (i.e. Neurotic-Extraverts (HN-E), Neurotic-Introverts (HN-I), Stable-Extraverts (LN-E) and Stable-Introverts (LN-I)) differences between the mean scores of the teachers' attitudes to curriculum innovation in these four zones would become apparent and could be tested for significance.

However, as we assumed that the context of curriculum innovation was conducive to very intense emotions in teachers, and that differences between introverts and extraverts were probably "washed out", "zone analysis" was not likely to be a very useful analytical tool. Moreover, it seemed impossible to make precise predictions about the likely differences between the mean attitude scores in the different zones, except perhaps to say that we might expect the mean attitude score of the Neurotic Extraverts (HN-E) to be low because of their high Emotionality and low Conditionability, and the mean attitude score of the Stable Introverts (LN-I) to be high because of their low Emotionality and high Conditionability.

Furthermore, our interest in the present study was directed towards determining not only the amount of variance in the teachers' attitudes to curriculum innovation which could be explained by various forms of RESISTANCE-within-PERSONALITY but also the amount which could be explained by the summation of RESISTANCE-within-PERSONALITY, over these various forms. We needed to obtain factors of RESISTANCE-within-PERSONALITY that were less specific than any one single personality variable in the study. We therefore had to derive new measures of RESISTANCE-within-PERSONALITY from the four personality variables: Dogmatism, Rigidity, Neuroticism and Extraversion.

Unfortunately, the psychological literature was not sufficiently documented on the relationships between these four personality variables to enable us to work out the weighted summations of resistance due to these variables. The findings of various researches concerning these relationships were not consistent. Thus, Watson (1967) had observed that the Neurotic Introverts (HN-I) among his subjects were the more Dogmatic ones. On the other hand, Drakeford (1969) showed that the Neurotic Extraverts (HN-E) were the more Dogmatic among his subjects and that the Stable Extraverts (LN-E) were the least Dogmatic. He found justification for his results by substituting Stability (LN) for low drive and Extraversion (E) for low Conditionability in Hull's equation. The combination of low drive and low Conditionability multiplicatively made the Stable Extraverts more open-minded. Fruchter and others (1958) found that Dogmatism and Anxiety loaded on a common factor. Smithers' (1970) inquiry supported Rokeach's hypothesis of a relationship between Dogmatism and Anxiety but gave no indication of interaction effects due to Neuroticism and Extraversion. Smithers pointed to the extreme open-mindedness of the Canadian students in Drakeford's study, and intimated that a low level of Neuroticism might be an important factor in bringing about change in the direction of openmindedness.

As for Rigidity, Watson (1967) found that there were no differences between his four groups of students categorised by Neuroticism and Extraversion (that is, HN-I, HN-E, LN-I, LN-E) in their degree of Rigidity as measured by the ability to produce novel or changed responses (Rokeach, 1960). Drakeford (1969) showed that Rigidity as measured by Gough and Sanford's (1952) scale seemed unrelated to Neuroticism and Extraversion, contrary to Eysenck's (1962) findings.

Because of this lack of consistent evidence about the relationships between the four personality variables, the weighted summation of RESISTANCE-within-PERSONALITY due to these variables could only be obtained from our own data. Briefly, factor analysis was the obvious technique for extracting the common underlying factors from the inter-correlations of the four personality variables. The factors were designated as RESISTIVITY FACTORS. Given that Extraversion and Neuroticism were in Eysenck's description of personality, the two fundamental dimensions of PERSONALITY and that they were orthogonal to each other, it was to be expected that the RESISTIVITY factors would be anchored to these two dimensions in our sample of teachers. Consequently, we expected to extract a minimum of two factors and a maximum of four. All that remained then was to determine the correlations of <u>each</u> RESISTIVITY FACTOR with the teachers' attitudes to curriculum innovation in order to estimate the amount of variance in each of the measures of teachers' attitudes to curriculum innovation which could be explained by each RESISTIVITY FACTOR.

2.14 CATASTROPHIC CHANGES IN TEACHERS' ATTITUDES TO CURRICULUM INNOVATION

The propositions that we have advanced so far concerning the dynamics of change in teachers' attitudes to curriculum innovation have had this in common, that they have assumed that changes in teachers' attitudes were gradual and continuous. They left unexplained the possibility of sudden, dramatic changes in the teachers' attitudes: the kind of changes that might be expected from an application of Catastrophe Theory (Zeeman, 1976; Chidley, 1976) to belief-disbelief systems according to the model proposed in Appendix R. Thom (1975) himself, the creator of Catastrophe Theory, had reservations concerning the quantitative modelling of a system when there was no underlying general law acting on that system. Nevertheless, it was arguable that catastrophic changes could take place in teachers' belief-disbelief systems with regard to their attitudes to curriculum innovation. But, in order to detect their occurrence, longitudinal studies of such changes (rather than cross-sectional studies) were required in spite of the well-known practical disadvantages that longitudinal studies entailed (Smith, 1975). For that matter, the models in Figures 2.5 and 2.7 also required longitudinal studies for their verification. But our aim in the present study was not to test any particular model of the effects of Dogmatism and FAMILIARITY on teachers' attitudes to curriculum innovation.

However, it seemed that if catastrophic changes did occur in teachers' attitudes to curriculum innovation then the correlations of these attitudes with other variables could be affected. This point was better appreciated from Appendix R. Briefly, we started with the assumption that for a given degree of conflict arising from an innovation in the curriculum the distribution of teachers' attitudes towards the innovation was unimodal and that a particular attitude had the maximum probability of occurrence. If for different degrees of conflict those attitudes which had the maximum probability of occurrence were plotted, then, according to Catastrophe Theory the graph that would be obtained would have a peculiar form as shown in Appendix R. The distribution of the teachers' attitudes would cease to be unimodal at the point where intense conflict split their attitudes drastically; the distribution would be distorted and extremes of attitudes would be emphasised. In these circumstances, there was the possibility of large and sudden changes occurring, and the respective correlations between the measures of teachers' attitudes to the innovation and other variables would then tend to be over-estimated (Borgatta, 1962).

2.15 THE MAIN PROPOSITIONS

Broadly speaking then, two main propositions (or general hypotheses) were derived from our theoretical discussion. Expressed in general terms, they were as follows:-

PROPOSITION 1

Teachers' attitudes to curriculum innovation will correlate significantly and negatively with RESISTANCE-within-PERSONALITY variables (such as Dogmatism and Rigidity).

PROPOSITION 2

Teachers' attitudes to curriculum innovation will correlate significantly and positively with KNOWLEDGE of curriculum innovation variables (that is, with FAMILIARITY and with ATTENDANCE on a COURSE of specific training focused on curriculum innovation).

To express these propositions as statistical hypotheses required that teachers' attitudes to curriculum innovation be defined in operational terms. We therefore discussed the definition and measurement of teachers' attitudes to curriculum innovation in Chapter 3, and then, in subsequent chapters, we stated our hypotheses in specific terms. In this way, the empirical investigations surrounding our propositions were guided in India by two specific hypotheses (sub-Hypotheses I and II of Chapter 4) and in England by four specific hypotheses (sub-Hypotheses V, VI, VII and VIII of Chapter 6). Other hypotheses also guided our empirical investigations but they were not linked up with our two main PROPOSITIONS. These other hypotheses were designated as sub-Hypotheses III and IV (see Chapters 5 and 6, respectively).

CHAPTER 3

THE RATIONALE FOR THE ANALYTICAL PROCEDURES

3.1 INTRODUCTION

In this chapter the emphasis was on the rationale for the procedures that were adopted in the present study rather than on the procedures themselves. We begin by giving the rationale for the procedures used to obtain the dimensionality of the universe of content for teachers' attitudes to curriculum innovation. We then go on to describe the basis of the procedures for "explaining" (in quantitative terms) the variance in the teachers' attitudes, for replicating the study and extending it in England, and for carrying out our quasi-illuminative study of the curriculum innovation in TAMIL NADU. These procedures were not uncommon in social research and in educational research but in this chapter we attempt to explain the particular reasons for using them to suit our purposes. Subsequently, in Chapters 4, 5 and 6 we describe in detail the actual procedures themselves.

3.2 THE RATIONALE FOR OUR APPROACH TO THE MEASUREMENT OF TEACHERS' ATTITUDES TO CURRICULUM INNOVATION

There were two questions which had to be answered if we were to arrive at an estimate of the correlations between teachers' attitudes to curriculum innovation and independent variables such as Dogmatism, FAMILIARITY and Attendance on a Course. These questions were:

(a) what was the dimensionality of the universe of teachers' attitudes to curriculum innovation?

and

(b) how could reliable measures of each dimension of this universe be developed in order to enable us to test specific hypotheses subsequently?

A difficulty of major importance was that curriculum innovation was a "dynamic process" (see Chapter 2). Consequently, there was probably not much perceptual constancy over time on the part of teachers, that is, many of the teachers who were caught up in such a dynamic process probably experienced perceptual changes together with an accelerated expansion of their consciousness and this required varying degrees of cognitive restructuring. Indeed, under certain conditions, this could be accompanied by spontaneous, "catastrophic" changes.

Our problem, therefore, was to determine the dimensionality of the universe of teachers' attitudes at a given point in time and to derive measures that were reliable (in the statistical sense) for each dimension of attitude. To resolve this problem we had to relate the literature on attitude theory and measurement to our problem; this we did in the first sections of the present chapter.

It should be said that since the present study originated from our interest in the Indian innovation in Engineering Drawing, it was in India, that we first came face to face with the problem of the dimensionality of the universe of teachers' attitudes to curriculum innovation. Consequently, our approach to the problem of dimensionality was largely influenced by our overall research design in India; that is, it was not simply a matter of obtaining the dimensionality of the universe of teachers' attitudes but, in addition, measuring instruments had to be developed to allow us to test specific statistical hypotheses (as reported in later chapters).

The preferred technique for studying the two questions posed above was "exploratory" factor analysis and much of our concern in the next section below was to make explicit the logic of this approach. However, the "reliability" of a particular measure was but one of the recognised hallmarks of psychometric measures; another was its validity. Consequently, the present chapter also examined the basis on which we could claim content validity, construct validity and criterion - related (or concurrent) validity for our measures of attitudes to curriculum innovation.

The different approaches to the concept of "attitude" (Allport, 1935; Lemon, 1973) called for a definition of the term as we used it in the present study and for its differentiation from the term "perception". A gross but seemingly unavoidable over-simplification in the circumstances was to use the term "perception" to refer specifically to teachers' overt responses to questionnaire items about curriculum innovation, and to reserve the use of the term "attitude" to those factors which were derived by the factor analysis of the teachers' responses.

3.2.1 THE LOGIC OF OUR APPROACH THROUGH FACTOR ANALYSIS

Although there might not be a great deal of consistency or stability <u>over time</u> in teachers' perceptions of curriculum innovation, it seemed, nevertheless, possible to expect a degree of consistency in their perceptions at a particular point in time. But this expectation begged the question of what exactly was meant by the teachers' perceptions of curriculum innovation, how these perceptions could be measured and what was the relationships of these perceptions to the teachers' attitudes to curriculum innovation because it was with the latter that we were concerned.

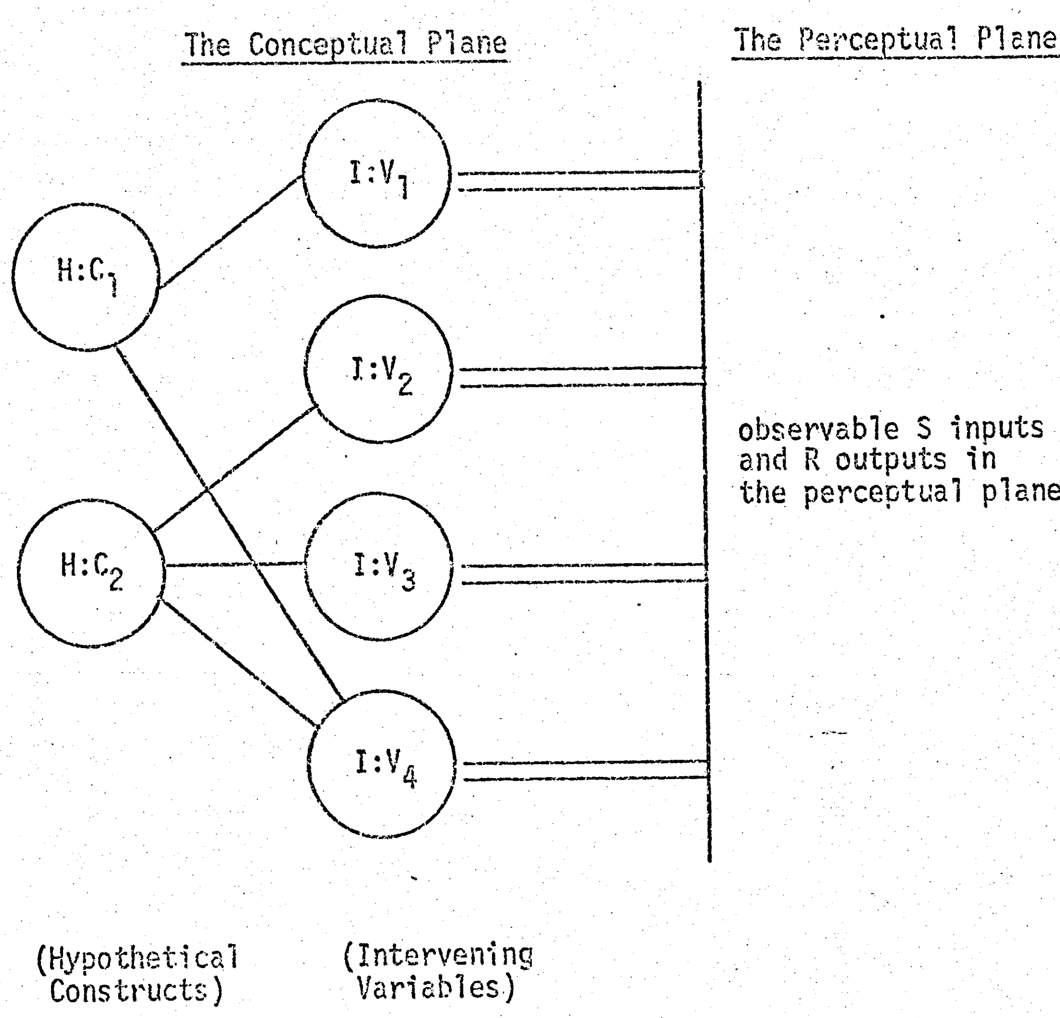
We have seen already that Forgus (1966) defined perception as the process by which information was received or extracted about the environment and that the output of this activity could be expressed in some form of objectified behavioural responses. On the other hand, Ackoff and Emery (1972) have conceptualised perception as a two-stage production process in their analysis of "purposeful" systems (of which human beings were the most familiar examples). At the first stage, a stimulus (X) produced "structural changes" (Y) in an individual. These were changes in "structural properties", that is, in the senses. The changes were termed "reactions" as distinct from "responses". Reactions were not under the individual's control. At the second stage of the process, however, the individual might <u>respond</u> to these reactions. Of course, every reaction was not necessarily followed by a response. For example, we might feel cold without responding to what produced it. However, if we sensed cold and responded to what produced it, it could then be said that we perceived a draft. Perception was thus a response to a stimulus which produced structural changes in the individual.

Now, in the context of curriculum innovation, teachers experimented with numerous innovative curriculum materials and teaching methods and it was assumed that they responded to the stimulation of innovation. We, therefore, reserved the term "perception" for their <u>specific</u> responses to stimulation by <u>specific</u> aspects of curriculum innovation. In practice, these specific aspects were described by <u>specific</u> stimulus-statements inserted in a questionnaire about curriculum innovation and the term "perception" then referred to the responses to these specific statements. <u>Operationally</u> then, in the present study, the PERCEPTION of an individual teacher for a specific aspect of curriculum innovation was the score that he obtained for his response to a specific stimulus-statement about that specific aspect.

We assumed that these perceptions were mediated by ATTITUDES. The distinction made here in the use of the terms "perceptions" and "attitudes" was of fundamental importance in the present study. In order to comprehend the nature of attitudes in this sense, that is, as mediation variables and to understand their measurement it was useful to refer to Royce's (1963) discussion of the relationship between perceptual and conceptual "planes" (Figure 3.1). These two planes corresponded respectively to the empirical and theoretical components of science (Margenau, 1950). Constructs in the Conceptual plane were linked to observable data in the Perceptual plane, forming together a "nomological" net (Feigl, 1956). This network was not as tight in the "less well-developed sciences" (e.g. in psychology) as in the physical sciences. Nevertheless, this network concept was important because in terms of the more common S-O-R paradigm, the O variables were in the Conceptual plane between the observable S inputs and R outputs in the Perceptual plane. These O variables could be regarded as functional unities which emerged from the situation and determined the covarying response pattern. From this point of view, an attitude was a mediating, "latent variable" (Lazarsfeld, 1950; Green, 1954) or construct which accounted for the covariation of a number of different responses (R) to a set of stimuli (S). In practice, these latent variables or constructs were arrived at by FACTOR ANALYSIS (Lemon, 1973; Weichmann and Weichmann, 1973) and scales used to measure them were mathematically constructed to

FIGURE 3.1

THE DISTINCTION BETWEEN HYPOTHETICAL CONSTRUCTS (H:C) AND INTERVENING VARIABLES (I:V)



explain the relations between the responses (Garner and Creelman, 1967).

Royce has also examined the distinction made by MacCorquodale and Meehl (1948) between "intervening variables" and "hypothetical constructs". The distinction was between constructs which merely abstracted the empirical relationships and those which were hypothetical in that they involved the supposition of entities or processes which were not observed. The theory of intervening variables and hypothetical constructs in psychology was largely linked up with the writings of Hull (1943) and Tolman (1938). However, Royce made a synthesis of these different ideas and proposed Figure 3.1 as a representation of an analysis of factors in terms of the Margenau-Feigl nomological net. Royce restricted the use of the term "intervening variables" to first-order factors and the term "hypothetical constructs" to higher-order factors. It followed that "intervening variables" were data-oriented constructs. They were factors which were closest to the empirical data. This was indicated by double lines in Figure 3.1. "Hypothetical constructs" were deeper within the nomological net.

As for attitudes to innovation, the distinction which was made in the literature about innovation was that between a "general attitude" towards change and a "specific attitude" towards a particular innovation (Rogers, 1971). As we saw in Chapter 1, in his study of innovation in three Michigan schools, Lin (1966, a) discussed two measures of teachers' attitudes towards change. One was a measure of "change orientation"; the other was a measure of "innovation internalization". "Change orientation" was an individual's degree of general disposition towards change. "Innovation Internalization" was the extent to which a member of an organization perceived the innovation to be relevant and valuable to his role performance. However, Lin's results showed that these two variables were not independent of each other; the product-moment correlation between them was significant at the one per cent level ($r = 0.5$, $n = 119$). Besides, the debate on general versus specific attitudes in the social field had a long and confusing history (Sanai, 1950; Eysenck, 1944), much like the debate about intelligence factors in the field of mental abilities (Thurstone, 1934), and to extend the arguments into the field of curriculum innovation seemed to us to be probably a fruitless exercise.

Instead, our own approach to the question of teachers' attitudes to curriculum innovation was essentially empirical. Intervening Variables were obtained by a first-order factor analysis of the teachers' responses to questionnaire items about curriculum innovation. This analysis was used for dimensioning the data collected in India. Sets of items were used to represent the factors; these sets were in effect new "composite variables" that were made up of only those items that were salient for the respective factors. In so doing, the likelihood of obtaining reliable measures of attitude was increased. However, the orthogonality of the factor structure was lost and consequently, it was possible to factor analyse the correlations between the new "composite variables". This was an important step in our analysis of the teachers' responses because one of the criticisms which we have levelled against previous studies of the relationships between

Dogmatism and teachers' attitudes to curriculum innovation (see Chapter 1) was that the teachers' responses were studied at a rather low level of personality organization (Eysenck, 1970, a), that is, either at the level of specific responses to specific items or at the level of responses to clusters of items which were internally consistent. In terms of the statistical model elaborated by factor analysis these consistent responses were responses for specific factors; they were responses divested of their error components. But our aim in the present study was not simply to develop measures of attitudes to curriculum innovation which were internally consistent. We wanted measures which would enable us to estimate the amount of variance in these attitudes which could be explained by a number of independent variables including PERSONALITY variables; and because we were dealing with PERSONALITY variables it seemed more appropriate to study the teachers' responses to curriculum innovation at a higher level of organization. This was the level at which a number of specific factors underlying the teachers' specific responses to specific items were themselves organized into groups of factors because of the intercorrelations between these specific factors. These were in the language of factor analysis, group factors. They represented in effect a greater penetration into the nomological network. In terms of the factor model, each such group factor was a system of specific responses divested of its error variance and of its specific factor variance. Such a model of the organization of teachers' responses to curriculum innovation enabled us to study the teachers' responses at a level which corresponded closely (in terms of the hierarchy of personality organization) to that of personality itself.

However, in practice, as we explain in Chapter 4, our overall research strategy in India required of us to factor analyse separately different samples of items taken from the original pool of items which we collected for our questionnaire about curriculum innovation. This meant that the first-order factors that were extracted from these different samples of items were not, in fact, the reference axes for the <u>total</u> pool of items. Consequently, the factor analysis of the intercorrelations of the new "composite variables" which represented these first-order factors was <u>not a second-order factor analysis</u> in the true sense of the term. In order to avoid confusion, the first-order factor analysis of the different samples of items about curriculum innovation was called a <u>first-level factor analysis</u> and the factor analysis of the intercorrelations of the new composite variables was called a <u>second-level factor analysis</u>. It also followed from our approach that Royce's distinction between Intervening Variables and Hypothetical Constructs was now adumbrated. These same terms were however retained in order to avoid introducing yet more terminology that was new. Each second-level factor was taken to cover a major attitude area and each first-level factor a sub-area. Operationally, for any particular factor of attitude (at the first-level or second-level) a teacher's attitude to curriculum innovation was given by the sum of scores (appropriately weighted as described in Chapter 4) that he obtained in his responses to those stimulus-statements that represented that factor of attitude.

Now, a possible distinction which we could have made was that between ATTITUDE and BELIEF (Rokeach, 1968). However, according to Osgood and others (1957) in their work on the measurement of "meaning", virtually any concept was observed to load on an "Evaluative" dimension: all beliefs were conceived to have evaluative as well as cognitive components (Fishbein, 1967). Rokeach described an attitude as an organization of interrelated beliefs around a common object and the attitude had cognitive and affective properties by virtue of the fact that several beliefs comprising it had cognitive and affective properties that inter-acted and reinforced one another. It followed that we could probably interpret the first-level factors from our factor analysis of the teachers' responses as being the main dimensions of the teachers' belief system; the second-level factors would then be the main dimensions of the teachers' attitude system. But this interpretation might incorporate further complexities in our analysis of teachers' attitudes and confuse the issue so that we did not take it further.

Basically then, our proposition was that an individual teacher's "perceptions" (or responses) concerning a whole range of stimuli in the context of curriculum innovation might in fact be based on a small set of factors; in other words, what appeared as a great variety of responses about curriculum innovation might be only the permutations and combinations of a relatively small number of underlying factors (Goodenough, 1949). To explain a large array of data in terms of a smaller set of concepts was not unknown in science; indeed, Gulliksen (1959) has reminded us that it was one of the goals of science.

Thus it was that factor analysis was one of the main analytical techniques used in the present study. It enabled us to compare factorial structures of teachers' attitudes to curriculum innovation in different samples in India and, indeed, cross-nationally. It also enabled us to develop measures of attitude to curriculum innovation which had known reliabilities (in the sense of internal consistency). As we saw in Chapter 1, Taylor, Reid and Holley (1974), as well as Lin (1966, a), realised the need for internal consistency. However, they did not consider the factorial structure of the universe of teachers' attitudes to curriculum innovation at the same time whereas our aim was to determine the dimensionality of this universe and then to obtain for each dimension a measure of acceptable homogeneity.

Hence, it was not a matter of using the technique of factor analysis because it was "bound to produce something" and because it promised "to salvage something out of the data" as Fletcher (1974) has remarked. Neither were we trying to make silk purses out of sows' ears through factor analysis! (Gardner, 1975)

3.2.2 INTERPRETATION OF THE FACTORS OF ATTITUDE TO CURRICULUM INNOVATION

But whilst we might wish to disregard Fletcher's apparent cynicism we had to take him seriously when he rightly remarked that factor analysis brought the problem of identifying what had been found. For it was not always immediately obvious that the factors obtained in a factor analysis corresponded to any psychological entities. They could have an 'as if' reality (Cattell, 1946), that is, they might seem to represent a real influence at work, but it might be impossible to interpret them. A common practice was to attach verbal descriptions to factors on the basis of the content of the items which had the highest loadings on them (Hope, 1967). But

Scott (1966) has warned that factor analysts must give up "the temptation" to name a factor casually on the basis of an inspection of the way tests or items loaded on it. Characterization of domain areas in this way might be "hazardous" (Cronbach, 1955). This was specially so, it seemed to us, if there was an inadequate sampling of items from the universe of content and if the items were largely redundant.

Thurstone (1932) has pointed out that the matter of naming factors was "entirely extraneous to the statistical analysis". The statistical work might be quite correct but there could be considerable argument about the naming of the factors. However, help towards the interpretation of factors was provided to us by mathematics. Instead of rotating factors to optimize some abstract criterion like Thurstone's "simple structure", it was possible mathematically to transform a given factor-pattern matrix so that it was as much as possible like a hypothetical factor-pattern matrix constructed according to some hypothesis about the structure of the clusters of tests or items. After this "procrustean transformation" (Mulaik, 1972), the transformed factor-pattern matrix could be tested for its degree of fit to the hypothetical factor-pattern matrix. When used for hypothesis testing in this way, factor analysis was described as "confirmatory". The difficulty with confirmatory factor analysis, however, was that hypotheses about factors which operated in a particular group of tests or items could be quite erratic. In any case, in the context of teachers' attitudes to curriculum innovation there was such a dearth of insightful researches and of reliable findings that it seemed hazardous to formulate hypotheses about the factorial structure of teachers' attitudes to curriculum innovation. Our factor analyses were therefore "exploratory" rather than "confirmatory". They were done to obtain a picture of underlying patterns among our questionnaire items.

However, our second-level factor analysis enabled us to penetrate deeper into the "nomological net", thereby obtaining insight into the nature of the factors of attitude at both levels of factor analysis and bringing out their "meaning". Bechtoldt (1959) has drawn attention to the distinction which logical empiricists made between "meaning" and "significance". The "meaning" of a concept referred to its operational definition or empirical referent whereas its "significance" was indicated by the theoretical or empirical laws into which it entered. For example, the meaning of "manifest anxiety" was given by the procedures for presenting the selected verbal statements or items on the Taylor Manifest Anxiety Scale and for combining the weighted responses of each subject. The resulting score then defined (was the meaning of) the variable "manifest anxiety". On the other hand, the "significance" or usefulness of the Taylor scale depended on its relationships with other variables. To establish the significance of a scale or factor then, was synonymous with establishing its construct validity through a "nomological network" of relationships with other variables (Cronbach, 1955).

Now, as explained earlier, Intervening Variables and Hypothetical Constructs stood together in a nomological network of relationships. The net reflected a tight factorial structure arrived at through the logic of matrix algebra. We took the view therefore, that this kind of network relationships imparted "significance" to the factors within the net. As for "meaning", we shared the view of Royce (1963) that factors obtained from a factor analysis were operationally defined, and therefore meaningful. The first-level factors were "all operationally defined" because they emerged inductively as a function of several specifiable variables and the operations which were implied by our second-level factors were also "as clearly specifiable" as were those for the first-level factors. Admittedly, the second-level factors were further removed from the original observations but this was the price paid for evolving higher-order constructs with stronger explanatory power. It did not follow that the verbal descriptions of the factors were necessarily any easier! And moreover, as it happened, one of the composite variables which represented the first-level factors escaped the net at the second-level of factor analysis (see Chapter 4). For that one, "significance" could only be established from its relationships with other variables, as McKennell (1970) has suggested in view of Cronbach's (1955) plea for construct validity.

3.2.3 THE RELIABILITY OF MEASURES OF TEACHERS' ATTITUDES TO CURRICULUM INNOVATION

Turning now to the question of reliability, "test-retest reliability" (that is, the reliability of a measure across time) ordinarily posed problems to researchers but in the context of innovation such problems were accentuated because of the dynamic nature of curriculum innovation. There was also the problem of "reactivity" to a test; this arose from the fact that a respondent's sensitivity to a variable (for example, a particular questionnaire item) could be enhanced by the very measurement of that variable. It seemed reasonable to assume that asking teachers about curriculum innovation was bound to heighten their interest in the curriculum, and cause them to discuss with a more than ordinary interest the particular innovation in which they were involved. Hence, a change in teachers' opinions over time was to be expected and consequently a low test-retest reliability for individual items.

For many practical reasons (such as cost and geographical distance) it was impossible to obtain test-retest reliability in the present study. Our emphasis was therefore on reliability in the sense of internal consistency. According to Guilford (1956), there could not be high internal consistency and at the same time low test-retest reliability, except after very long intervals. But Cronbach (1951) thought that there was "no mathematical necessity" for Guilford's statement to be true. The "Alpha Coefficient", an index of test consistency, could be either higher or lower than the test-retest reliability over an interval of time.

We found McKennell's (1970) "total approach" for obtaining reliability estimates for attitude scales, very useful. According to him, the approach was "superior to Likert scaling". The point here was that any specific stimulus-statement about curriculum innovation was open to many different types of interpretation by teachers and that idiosyncracies in response could be explained as measurement "error"; they were departures from the dimension or factor being measured. However, by building up a battery of specific stimulus-statements about different facets of the attitude factor or dimension, "errors" in the attitude score which were based on idiosyncratic responses cancelled each other out in the total attitude score and, consequently, the attitude measure gained in reliability.

In practice, the procedure was simple enough. Briefly, the results of the first-level factor analysis were used to cluster the inter-item correlation matrix. The items with the highest loadings on a Varimax factor were taken as the defining items for a particular cluster. By assigning each item to the factor on which it had the highest loading we achieved a cluster analysis with the desired property of maximum average inter-item correlation ($\overline{r}_{ij}$) values within the clusters. Actually, as McKennell (1968) has remarked, "factor analysis was not a completely efficient clustering technique"! The procedure that he recommended was to rewrite and inspect correlation matrices with the items loading on the same factor brought together. Items which were seriously misclassified stood out on merely inspecting the re-ordered matrix.

The reliability of a cluster of items obtained in this way was calculated by using an approximate formula for coefficient alpha (Cronbach, 1951) thus:

$$\alpha = \frac{n\overline{r}_{ij}}{1 + (n - 1)\overline{r}_{ij}}$$

where $\overline{r}_{ij}$ = the average inter-item correlation

n = number of items in a cluster

Alpha was an index of the common-factor concentration in the cluster; it was a measure of the internal consistency or homogeneity of the set of items.

Each cluster of items which was obtained from our first-level factor analysis and which had an alpha coefficient exceeding 0.5 was selected to form a scale in order to measure the underlying factor of attitude. Scale scores for such a composite measure were obtained by the unweighted summation of the constituent item scores, that is, by simply adding up the scores on the separate items. This was an "incomplete method" of calculating factor scores since the selected items which made up a particular composite variable were only those items which were salient for the corresponding factor. This method of factor scoring was adequate for a first-level factor analysis because at this stage of the analysis our interest was in simply obtaining reliable measures and not in getting the best fit to the data. Horn (1969) has shown that the reliability of a factor when calculated from the items on which it had salient loadings provided a lower bound for its true reliability. It followed from this, that the scales derived from our first-level factor analysis would have a true reliability greater than 0.5.

Traditionally, psychologists have required reliabilities at the 0.9 level for the assessment of intelligence and of personality. The reason for this was that they needed to discriminate between individuals on the basis of such assessments. But such a high level of reliability was not always necessary. According to Nuttall (1973), if one were trying to chart new areas of attitudes, one would be concerned with groups not individuals, and one would be able to tolerate reliability coefficients as low as 0.6 or 0.7; in fact, he added, there was "no exact limit". Bynner (1972) accepted alpha coefficients as low as 0.5 in his study of parents' attitudes to education, and Barker Lunn (1970) used a scale with alpha reliability of 0.58 in her study of children's attitudes at school. Moreover, in the survey situation, measuring instruments needed only to be reliable enough to distinguish between very broad groups of informants (McKennell, 1970). A somewhat similar point of view was expressed about the measuring instruments used in the context of curriculum innovations by the Centre for Educational Research and Innovation (OECD, 1972). It was acknowledged that whereas when an individual's future was at stake the measuring instruments used had to be "extremely carefully constructed", when we were evaluating a curriculum development project, we could afford to have "rougher and cruder instruments" since no one person's future depended on the result.

The present study was not primarily aimed at evaluating a particular curriculum innovation; nor did it hinge on the accurate placement of an individual teacher on a particular scale of attitude to curriculum innovation. The nature of the research was such that our interest was in relationships between variables within groups of teachers. For this purpose, scales with alpha coefficients as low as 0.5 seemed adequate. Moreover, as we explain in the next section below, for cross-national studies tests of relatively low homogeneity were probably more useful because of their higher validity.

3.2.4 THE DEVELOPMENT OF RELIABLE MEASURES OF ATTITUDES FOR CROSS-NATIONAL COMPARISONS

The emphasis on the internal consistency (test homogeneity) of attitude measures was not above criticism when viewed against more recent trends in itemetrics. Cattell's (1973) arguments seemed particularly strong. Supporting the idea that reliability and validity could not be both maximal (Guilford, 1956) and that it was not necessary to have high homogeneity for high test validity, he argued that a test of low homogeneity (because it sampled behaviour more widely) tended to maintain its validity across different cultures. It seemed that instead of test homogeneity, it was test "transferability" (Cattell, 1967) that we should aim at achieving since we intended to use the same items about curriculum innovation in England as in India. Test transferability was the tendency of a test to retain its particular validity, reliability and homogeneity despite changes in samples, populations of people or occasions. According to Cattell, when using the same test cross-culturally, a broad spread of behaviour indexed by items which had a low homogeneity resulted in higher transferability. Admittedly, Cattell was writing in the main about personality tests but the psychometric principles that he enunciated seemed applicable to the present study. However, Cattell (1973) has acknowledged that transferability was a form of test consistency "only recently defined" and "as yet scarcely even calculated". The ways to augment its magnitude were "insufficiently understood".

Consequently, we turned to the work of Przeworski and Teune (1966) because they have drawn attention to the problem of seeking the "equivalence of measures" in cross-national research. They have made the point that although "complete equivalence" was "probably never possible", attempts could be made to measure equivalence if concepts were based on sets of "indicators" rather than on single indicators. The authors suggested that the "meaning" of concepts in various countries had to be "reconstructed" through an empirical procedure. This consisted in finding "identity sets", that is, sets of "indicators" of concepts that were homogeneous. Homogeneity was to be measured here by the average inter-indicator correlations in a pooled, across-country analysis and indicators within the "identity sets" were said to have identical cross-national validity. However, it was recognised that apart from these "identity sets" there would be "indicators" which were specific to each country and yet correlated with the identity sets. Such "indicators" were said to have equivalent cross-national validity.

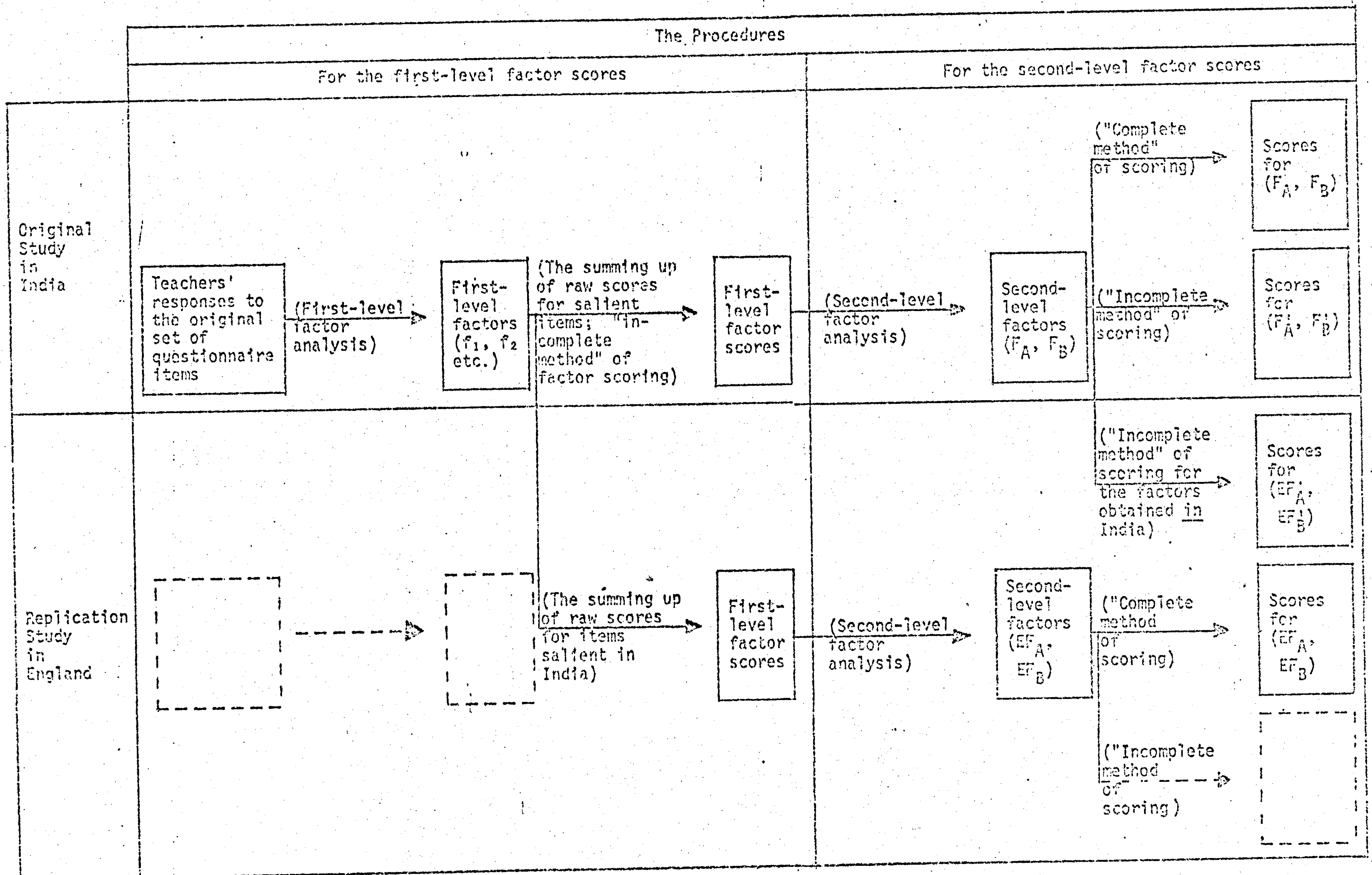
However, low correlations between indicators could be due to the indicators having opposite loadings on common factors (Cattell, 1973). Therefore, it seemed to us better to use factor analysis for obtaining "identity sets"; and, indeed, this is what Teune (1968) did in a comparative study of "activeness" in the United States and in India. He factor analysed the correlations for a number of indicators in order to locate the dimensions of "activeness" in the two countries. Factor loadings were then used as weights in computing the factor scores for these dimensions.

Our own approach was different although it was also inspired by the need to obtain homogeneous sets of "indicators". We sought first to establish the degree of similarity between the rotated second-level factors that were derived in India and those that were subsequently derived in England. In India, the second-level factors were extracted from the correlations between the teachers' scores for the "composite variables" that represented the first-level factors. In England too, the second-level factors were extracted from the correlations between the teachers' scores for those very same composite variables, although those composite variables represented first-level factors that were originally derived in India. This is because it seemed to us that the only way to compare the teachers' attitudes in England with the teachers' attitudes in India at the second-level of factor analysis was to start with the same measures of attitude at the first-level of factor analysis.

Figure 3.2 summarises our procedures for the factor analyses that were done in India and in England, respectively. The point to note was that in India the second-level factor scores were first calculated by the "complete method", that is, as a weighted summation of the standardised scores for each of the composite variables. The "complete method" gave us the best fit to the data and the factor scores provided us with the best possible summaries of the variation in the composite variables in accordance with the factor model. However, we had to ensure that for our REPLICATION STUDY in England (Chapter 6) we used (for comparison purposes) the same indicants of attitude as in India. Therefore, our second-level factors in England had to be represented by the same salient first-level factors as in India. Consequently, the factor scoring for the second-level factors in India was also done by the "incomplete method".

An objective measure of the similarity of factors which were obtained across various samples was Tucker's (1951) coefficient of congruence (see Appendix N). This coefficient had "similar properties to a coefficient of correlation", approaching a maximum of unity for the most precise congruence and a lower limit of zero for the least precise congruence. According to Triandis (1964), a "relatively vigorous criterion" for the acceptance of the "existence"

THE SEQUENCE OF PROCEDURES FOR OBTAINING THE FACTOR SCORES OF TEACHERS' ATTITUDES TO CURRICULUM INNOVATION IN INDIA AND IN ENGLAND, RESPECTIVELY



(Note: a. The dotted lines indicate the procedures not used in England
b. See Chapters 4 and 6 for the labelling of the factors)

FIGURE 3.2

of a factor across samples was a coefficient of congruence of 0.5 or more. We adopted this criterion and once congruence was established, the next step was to select for each pair of congruent factors those indicators that were salient on both factors since this selection yielded automatically the required "identity sets". Details of this procedure were given later in the report of our research in England (Chapter 6).

3.2.5 THE VALIDITY OF THE MEASURES OF ATTITUDE TO CURRICULUM INNOVATION

Referring to Nuttall (1973) again, when charting new areas of attitude, the validity of a scale was "a matter only of construct validity, not of content validity or predictive validity". Lemon (1973) saw the validation of a measure of attitude as a multi-stage process; content validity was but one stage in that whole process and it was part and parcel of construct validity. It seemed at first then that construct validity should be our objective in the validation process. However, Nuttall also thought that any form of measuring instrument needed to satisfy the criteria of content validity. We decided, therefore, that our measures of attitude to curriculum innovation should possess both construct validity and content validity. The procedures for establishing both these forms of validity were, therefore, followed closely. We used (yet again!) multiple factor analysis as the tool for establishing the construct validity of our attitude measures (Wiechmann and Wiechmann, 1973).

As for predictive validity, the present study was frankly not designed to determine it. But "predictive validity" was only one form of criterion-related validity (Bohrnstedt, 1970);

another form was "concurrent validity" and this aspect of validity is also examined in this section.

3.2.5.1 CONTENT VALIDITY

To take "content validity" first, Bohrnstedt (1970) has criticised researchers in the area of attitude measurement who were seemingly satisfied to devise on an ad hoc basis a number of items which they believed would measure what they wanted measured. The point he was making was that when constructing an attitude scale, items had to be sampled from the domain of content, that is, from the universe of attributes that defined the concept under investigation (Guttman, 1944).

Now, Cronbach (1951, 1963) has argued that the alpha coefficient was not only a coefficient of reliability; it was also a coefficient of domain generalizability. The reasoning here was that not only was the alpha coefficient a close estimate of the first-factor concentration, that is, of the proportion of variance attributable to the first factor among the items of a particular test; but it was also an estimate of the correlation expected between two tests drawn at random from a pool of items like the sample of items in the test. In other words, the sample of items which represented a factor was but one of a number of other samples of items which could be drawn out from the domain of content to define that factor. All such samples could be thought of as being repeated attempts to measure the factor and the alpha coefficient then indicated the degree to which we would expect to find the same factor in random samples of items from the domain of content (Mulaik, 1972).

In the present study, it could be said that for each factor of attitude to curriculum innovation there was a corresponding domain of content and that the alpha coefficient for that factor indicated how validly we could interpret the sample of items which measured that attitude factor as representative of the domain of content for that factor. Thus, the alpha coefficient was a measure of domain validity; and in this way, as Cronbach has put it, "the theory of reliability" and "the theory of validity" "coalesced".

Procedurally, in order to obtain items which were likely to be as representative as possible of different domains of content we adopted a number of strategies which were described in full in Appendix D. Briefly, however, these procedures consisted in:

(a) Studying the literature about curriculum innovation in general; scrutinising the Support Materials for the curriculum innovation in Engineering Drawing (in India); reading some of the literature about the specific innovation in Secondary School Mathematics in England in view of the intended Replication of the study (see also Appendix B).

(b) Interviewing, in India, various participants in the curriculum innovation in Engineering Drawing.

(c) Collecting, in India, the opinions of experts in industry and in engineering.

(d) Administering, in England, an open-ended questionnaire to a sample of Secondary School teachers of Mathematics involved in implementing the new curriculum in Mathematics (Appendix B).

A wide variety of statements were collected from all these sources; the statements were categorised and converted into items for our structured questionnaire about curriculum innovation (Appendix E). Bohrnstedt has pointed out that content validity was not easy to achieve because one could not ordinarily enumerate all of the elements in the universe of content. Our own stance was that the number and variety of procedures that we had adopted might enable us to claim with some confidence that we had sampled adequately the universe of content for the attitudes of teachers to curriculum innovation.

3.2.5.2 CONSTRUCT VALIDITY

A construct was an abstraction which entered in with other factors to determine performance in a variety of measures. It was something which was derived (or constructed) from a number of different observations. As defined by Cronbach (1955) it was "some postulated attribute of people, assumed to be reflected in test performance". Bechtoldt (1959) has criticised this definition saying that the "postulation" and "assumption" features were more accurately labelled hunches, guesses or working hypotheses. However, to inquire into the construct validity of a test was to determine what psychological or other property (or properties) could "explain" the variance of the test, that is, what factors were behind test performance (Kerlinger, 1973a). Thus, it was immediately apparent that factor analysis was to be the technique for establishing the construct validity of our attitude measures. For factor analysis told us which items measured the same thing and to what extent they measured what they measured. Indeed, factor analysis was "perhaps the most powerful method of construct validation" (Kerlinger, 1973a).

However, it could be argued that in order to ascertain the extent to which each of our scales of attitude to curriculum innovation actually acted as a measure of the underlying construct (or factor) we should use the "known groups" method (Cronbach, 1955) according to which, we should be able to demonstrate that differences between groups of teachers with known attitudes towards curriculum innovation were mirrored in their attitude scores on our measures.
But, it was not possible to do this in the present study because there were no groups of teachers who were known to be overtly in favour of curriculum innovation or in opposition to it. We could only assume that the likelihood that the attitude scales would fail to discriminate was much reduced by using the statements made by teachers themselves, and the sentiments expressed by other participants in curriculum innovation.

3.2.5.3 CONCURRENT VALIDITY

For this form of validity the question was to what criterion in the present study were we to relate our factors of attitude to curriculum innovation. To answer this question we had to return to one of the main questions posed at the start of the present study because, to ask (as we did at the beginning of the study) how much of the variance in the teachers' attitudes to curriculum innovation could be "explained" by RESISTANCE-within-PERSONALITY to change, was in effect to ask how valid were our measures of attitude for measuring resistance to change. And the answer to this question was that the coefficients for the correlations between the attitude measures and the RESISTANCE-within-PERSONALITY variables were in effect validity coefficients.

3.2.5.4 COMPLEMENTARY ASPECTS OF VALIDITY

Although on the basis of our approach to scale construction (as described above), it was possible to claim "Content Validity" and "Construct Validity" for our measures of teachers' attitudes to curriculum innovation, there were, nevertheless, in the measuring process itself, certain biases which tended to invalidate the measurement of these attitudes. However, these biases were not peculiar to our measures; they were well-known "Response Sets" of various kinds (Cronbach, 1946; Guilford, 1954). There were, for example, the "acquiescence response set", (the tendency to answer yes to all questions), the "desirability response set" (the tendency to answer all questions in a desirable direction), and the "extreme response set" (the tendency to make extreme responses to all items). If for any single measure of attitude it could be shown that these response sets accounted for a great deal of the total variance for that measure then that measure would have had to be rejected as invalid. But there was no means of determining the amount of variance which could be accounted for in this way at the time of our research. Response style theory (Martin, 1964) pointed to two main factors underlying response tendencies. There was Rudin's (1961) Rational Authoritarianism factor which offered the most definitive measure of one whilst Welsh's (1956) R scale, a measure of repression, defined the second factor.

Consequently, we simply acknowledged the possible limitations placed on the validity of our attitude measures by the presence of these insidious response sets. It seemed likely, for example, that a partial explanation of some of the "extreme responses" recorded in India (see Chapter 4) could be given in terms of an "extreme response set" on the part of those extreme scorers. However, it was assumed that the strict anonymity of the teachers helped to suppress the tendency to give socially desirable responses and that counterbalancing the items (that is, wording items so that a positive response to one item and a negative response to another both contributed towards increasing the score on the measure as a whole) reduced the effect of the "acquiescence response set".

Finally, the "halo effect" might be expected to influence some of our respondents. A particularly dominant feature in a curriculum innovation could well cast a halo round all other features so that these would be all overrated (or underrated) through the existence of this one attractive (or unattractive) feature. In India, for example, the sheer attempt to relate topics in the Engineering Drawing innovation closely to industrial drawings (see Chapter 4) could well have had a strong halo effect.

To summarise then, this section presented the rationale for the procedures that we adopted to study the universe of teachers' attitudes to curriculum innovation. The assumption was that this universe was multidimensional. Consequently, the problem was to determine the dimensionality of this universe and to develop reliable and valid measures for each dimension.

The present section was therefore essentially a theoretical discussion of the key concepts of dimensionality, reliability and validity. The emphasis was on the logic of our approach to the measurement of teachers' attitudes to curriculum innovation and on the limitations set by the very nature of the present study to the procedures and results described in the subsequent chapters.

3.3 THE RATIONALE FOR MULTIPLE CORRELATION ANALYSIS

The reason for using this statistical technique was that it showed the strength of the relationship between each of a number of "independent" variables (X) and a "dependent" variable (Y) whilst controlling the effects of other independent variables in a particular explanatory framework. In the present study (X) referred to the PERSONALITY and SITUATIONAL variables and (Y) referred to the measures of teachers' attitudes to curriculum innovation.

Multiple Correlation Analysis assumed a linear relationship between the variables and determined the coefficients of the linear equation which best approximated the observations (in the least - square sense). The multiple correlation coefficient was the Pearson product-moment correlation between the dependent variable and the least-square linear composite of the independent variables; that is, it was the correlation between the actual observed values (Z_Y) of the dependent variable (Y) and the values (Z'_Y) predicted from the equation. The square of the multiple correlation coefficient gave the portion of the variance of the dependent variable (Y) which was accounted for by the independent variables (X_1, X_2, X_3 --- X_n) in the equation, all in concert. However, our interest in the present study was not in predicting the values of the dependent variable (Y) from the optimum linear combination of the values of the independent variables. Our interest was in "explanation" (Kerlinger, 1973b) rather than in prediction; that is, we wished to determine the relative contributions of each independent variable to the variance of the dependent variable (Y).

Now, when correlations among the independent variables were all zero, it was possible to state quite unambiguously that the proportion of the variance in the dependent variable (Y) which was accounted for or "explained" by <u>each</u> of the independent variables (X_j) was $r^2_{YX_j}$ (the square of the correlation of (X_j) with the dependent variable (Y)); and that the total amount of variance in the dependent variable which could be explained by the independent variables was given by the equation:

$$R^2_{Y.(X_1, X_2, ---X_n)} = r^2_{Y.X_1} + r^2_{Y.X_2} + \ldots\ldots\ r^2_{Y.X_n} \quad \ldots (i)$$

(where R^2 = the Multiple Correlation Squared)

However, as Kerlinger (1973b) has pointed out, in <u>ex post facto</u> research (such as ours), independent variables were generally intercorrelated - sometimes substantially. It was then difficult to attribute unambiguously portions of the variance in the dependent variable to individual independent variables. Indeed, the notion of "independent contribution to variance" was meaningless in these cases (Darlington, 1968). The way out of this difficulty was to adjust the correlated variables so that their correlations were made zero (that is, they were "orthogonalized") bringing about a modification in the formula which now read as follows:

$$R^2_{Y.(X_1, X_2, --- X_n)} = r^2_{Y.X_1} + r^2_{Y(X_2.X_1)} + \ldots\ldots\ldots$$

$$+ r^2_{Y(X_n.X_1X_2 --- X_{n-1})} \qquad \ldots \text{(ii)}$$

The first expression gave the variance shared by variable Y and X_1; after that, each expression which was added last to the equation gave the variance contributed by the independent variable which was last entered into the equation, when the variance of the other independent variables (which preceded it), were partialled out. In fact, each term was the semi-partial correlation squared. According to Kerlinger, this method was "probably the best" way of estimating the relative contributions of the independent variables to the variance of the dependent variable.

However, the squares of the semi-partial correlations told us the variances contributed by the independent variables only for the particular order in which these variables entered the regression equation. Some researchers entered the independent variables in a particular sequence on the basis of theoretical presuppositions (Keeves, 1972; Peaker, 1975). But in the present study it was impossible to ascribe a different temporal status to each independent variable in the explanatory framework. The only assumption which could be made was based on Rogers' (1971) paradigm (for the innovation-decision process) in which PERSONALITY characteristics were antecedent variables (see Chapter 2). The assumption then was that RESISTANCE-within-PERSONALITY was antecedent to the teachers' attitudes to curriculum innovation and to the other independent variables included in the study. But given that we could not choose a particular sequence for entering the other independent variables and that the teachers' attitudes were to be the dependent variables it seemed better to allow the computer to choose the order for entering the independent variables. The procedures by which the computer program selected variables in turn are described in Chapter 4.

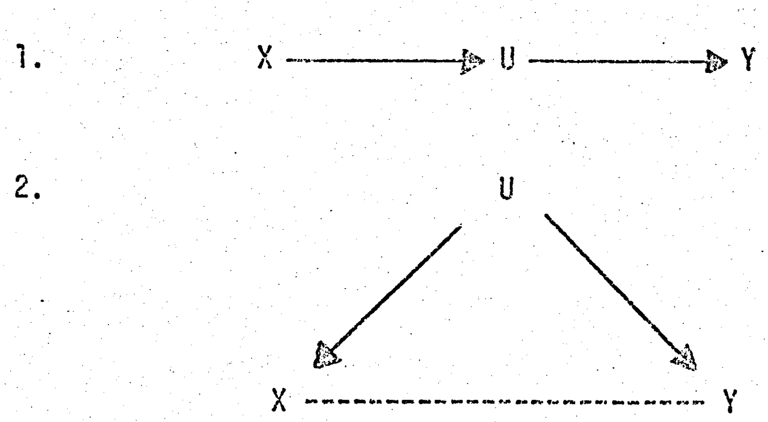
3.4 THE ELUCIDATION OF CAUSAL RELATIONSHIPS

The relationships implied in the Multiple Correlation model described above could be expressed in the form of an "if - then" statement; that is, the basic equation could be interpreted as saying "if X_1, then Y, under conditions X_2, X_3 ------ X_n". Now, according to Kerlinger (1971), propositions of the "if - then" kind could be said to "explain" phenomena and what was interesting was that causal laws were also of this very form (Blalock, 1964). However, causal laws were of a hypothetical nature and they could never be tested empirically. The reason was that it was always possible that some unknown forces might be operating to disturb a given causal relationship or to lead us to believe that there was a causal relationship when in fact there was none. This is why Simon (1957) preferred to confine the notion of causality to hypothetical 'models'. In this kind of model building we started with a finite number of specified variables, thus admitting that our model would be a highly oversimplified version of the real world. We assumed that the intervening and antecedent variables which were explicitly included in the model had been controlled. It was then possible to say that an independent variable X was a direct cause of a dependent variable Y, if and only if a change in X produced a change in the <u>mean</u> value of Y. If on the other hand a change in X did not produce a change in the mean value of Y, then X was not a direct cause of Y. Actually, the empiricist would still object that we could not tell empirically whether the change in X "produced" the change in the mean value of Y (Bunge, 1959); all we could observe was that a change in X was followed by a change in Y.

However, according to Blalock, variables which were closest together in a causal chain had the highest correlations with each other. Thus, if three variables X, U and Y were related causally as in Figure 3.3, then the correlation between X and U and that between U and Y would both be greater than the correlation between X and Y. Moreover, because X was not a direct cause of Y, the first-order Partial Correlation between X and Y, with U held constant, would approximate zero or at least be considerably reduced. In these models a causal relationship was indicated by a uni-directional arrow from the determining variable to the variable which was dependent on it and the vanishing of a partial correlation was indicated by a dotted line as in Figure 3.3.

FIGURE 3.3

MODELS SHOWING POSSIBLE CAUSAL RELATIONSHIPS BETWEEN THREE VARIABLES



(Note: Causal relationships were indicated by arrows from the determining variable to the variable that was dependent on it.)

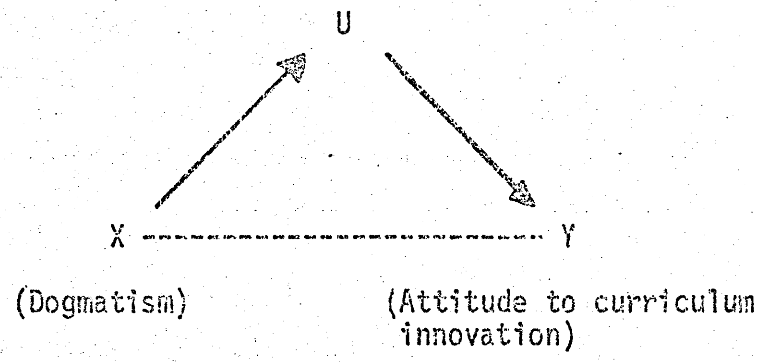
Mathematical reasoning of this kind provided us with a useful method for studying causal relationships in the present study. Causal models were proposed, then checked against the research data and retained or rejected accordingly. However, no given causal model could be said to be the only correct one. The best that could be said about a proposed causal model was that it was probably the most plausible one amongst alternative causal models. This type of causal model was a "weak form" of path analysis (Boudon, 1965) but it seemed to us that it was adequate enough for exploring causal relationships in a simple way (as we were trying to do).

Now, going back to the assumption that "RESISTANCE-within-PERSONALITY" to change anteceded teachers' attitudes to curriculum innovation, it followed that there were two possible causal models which could be explored; these were drawn in Figure 3.4 with Dogmatism as one form of RESISTANCE-within-PERSONALITY. In Model 1 the supposition was that there was no direct causal relationship between Dogmatism (X) and the teachers' attitudes to curriculum innovation (Y). The influence of Dogmatism on the teachers' attitudes was mediated through an intervening variable (U). When U was controlled, the correlation between Dogmatism and attitude to curriculum innovation approximated zero. Model 2 on the other hand, implied that the apparent relationship between the teachers' attitudes to curriculum innovation (Y) and a variable (U) was brought about by the correlation of Dogmatism with both Y and U. When, therefore, Dogmatism was partialled out, the correlation between Y and U vanished.

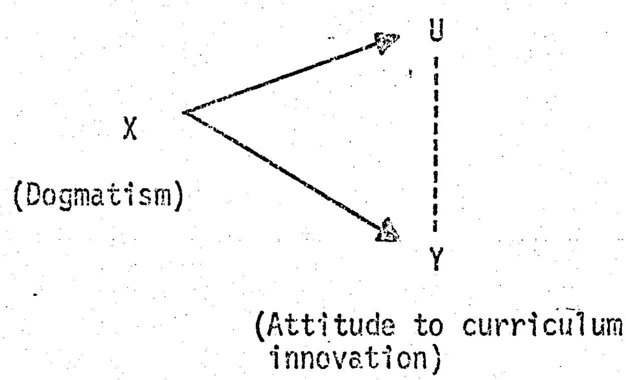
FIGURE 3.4

POSSIBLE CAUSAL MODELS FOR THE RELATIONSHIPS BETWEEN A FACTOR OF ATTITUDE TO CURRICULUM INNOVATION, AND ITS CORRELATES (DOGMATISM AND ONE OTHER INDEPENDENT VARIABLE) FOR A SAMPLE OF TEACHERS

Model 1



Model 2



(Note: Y = A factor of attitude to curriculum innovation

U = A correlate of Y other than Dogmatism.)

Of course, for every such U variable there was yet another set of alternative models with U as the variable which was antecedent to both Dogmatism and teachers' attitudes to curriculum innovation. However, this possibility was not seriously considered in view of the basic assumption that resistance to change was grounded in personality itself. We were, therefore, mainly concerned with the evaluation of the two causal models shown above. This evaluation could only be done a posteriori (that is, after the intercorrelations of all the variables in the study had been computed) because only then were we in a position to pick out suitable U variables and propose possible causal models. Theoretical considerations alone did not allow us to formulate specific causal models with specified pre-determined U variables. The search for appropriate U variables was, therefore, unhypothesised.

3.5 THE RATIONALE FOR OUR "QUASI-ILLUMINATIVE" APPROACH

Although the central problem of the present study was to determine quantitatively the extent of the relationships between teachers' attitudes to curriculum innovation and certain selected PERSONALITY and SITUATIONAL variables, it was readily recognised that numerous SITUATIONAL variables other than those included in the explanatory framework for our Multiple Correlation Analyses could also be effective in determining the nature of teachers' responses to curriculum innovation. We had, therefore, to examine the SITUATIONAL factors within the innovative context closely and systematically. And, although for the TAMIL NADU teachers it was possible to think of the total response of each individual teacher to the innovation in Engineering Drawing as being summated psychologically over all his responses to the items in the questionnaire about the innovation, it could still be argued that this summation was not fully representative of his overall response, because it could not be claimed that the questionnaire, however carefully planned, sampled the perceptual universe completely. In any case, there were aspects of the stimulus-situation which could not be summarily represented in the form of brief stimulus-statements in the questionnaire. We needed, therefore, data complementary to that which we collected by our structured questionnaire. It seemed to us that such additional information might provide us with a broader and much enriched perspective of the innovation and enable us to make a judgment (albeit a subjective one and one in non-quantitative terms) as to the relative contributions of SITUATIONAL variables (other than those included in our explanatory framework) to the variance in the teachers' attitudes to curriculum innovation. In other words, we might become better informed about the proportion of the variance in the teachers' attitudes which remained "unexplained" by our Multiple Correlation Analyses.

Parlett and Hamilton (1972) amongst others have utilized an "illuminative" (Trow, 1970) methodology for the "evaluation" of innovations. They have criticised the use of conventional psychometric techniques which have been predominant in the study of innovatory programmes, and have suggested that the evaluator should seek his methodology from a field like social anthropology so that an innovation was examined in its "learning milieu" and not in isolation. They have argued that the classroom "learning milieu" represented a nexus of cultural, social, institutional and psychological variables which interacted in complex ways and produced in each class or in each course a unique ethos which suffused the teaching and learning that occurred there. The introduction of innovation in the "learning milieu" set off a chain of repercussions throughout that "milieu" and it was therefore absurd not to pay attention to the factors that influenced the "learning milieu" when attempting to gauge the impact of the innovation. Thus, the model of curriculum evaluation which Parlett and Hamilton proposed took account of the wider contexts in which educational innovations functioned and it was concerned with description and interpretation rather than with measurement.

However, as we have already remarked, it was of fundamental importance to recognise that the objective of the present study was not to carry out a curriculum evaluation exercise in the full sense of the term. Admittedly, the word evaluation itself had come to be used with different meanings and, as Sparrow (1973) has observed, the most common role of the evaluator has been one in which he was responsible for gathering and organizing the reactions of teachers (and students) to the innovative materials of curriculum projects. But the main objective of the present study was to research mainly into the relationships between teachers' attitudes to curriculum innovation and their RESISTANCE-within-PERSONALITY without, however, neglecting to examine at the same time the SITUATIONAL factors which could "illuminate" some of these attitudes. Cooper (1973) has argued that evaluation had a "service function" in that the evaluator had a major commitment to the innovation and to the people concerned with it. The researcher on the other hand created his own terms of reference and set up his own research problem. We saw ourselves more in the capacity of a researcher than in that of an evaluator. For it seemed to us that a model for the evaluation of the innovation in TAMIL NADU would have had to incorporate judgments on certain crucial aspects of a vocational curriculum; for example, it would have had to demonstrate by a follow-up study the improved efficiency of the products of that innovation (i.e. the technician students) in industry. Lin (1966a) has made the important point that any educational innovation should be evaluated in terms of its impact, positive and negative, upon the students. Moreover, as Harlen (1976) has rightly said, evaluation was not concerned only with the overall characteristics, variables and processes relating to the classroom but also with individuals, "each with his own set of abilities, preferences, styles of learning, attitudes, interests and past experiences". We were not in a position either to organise a follow-up study or to individualise the evaluation of the innovation.

Now, Sheldrake and Berry (1975) have described the tendency to dichotomise methodology in educational research as either "illuminative" or "psychometric", as mistaken. It was a "somewhat out-dated" debate. In their studies of innovations in education they found that there were four research options opened to them as a result of classifying educational research along two dimensions, namely, the "Involved versus Detached" dimension and the "Prescriptive versus Analytic" dimension. The "Involved" researcher had access to situations and to data that was inaccessible to the researcher who remained "Detached". On the other hand, the "Detached" researcher gained a more "objective" view of the innovative situation as it unfolded.

Our own overall research strategy could be located within the "Detached-Analytic" quadrant. However, to the extent that it was possible we wanted to examine aspects of the innovative context other than those which we studied by our questionnaire about the innovation. It was not intended to make a truly "illuminative" study because such a study was not within our official terms of reference. But in order to complement our main analyses in India, we made a quasi-illuminative study aimed at guessing the kind of debate which presumably went on among the Polytechnic teachers concerning the innovation. It was as if we were trying to implant a few crude sensor-like information detectors at just a few selected points in the USER SYSTEM in order to probe deeper into these areas and pick up more information about the on-going activity at those points. Underlying the various strategies used was the general assumption that in the teachers' "cognitive map" (Tolman, 1948) of the innovatory programme in TAMIL NADU, certain points emerged with some prominence because of the subjective uncertainty that they engendered. These were points of perplexing incongruity (Hunt, 1963) and points of intriguing similarity. We imagined them as underlying to some extent the dynamics of perceptual organization in the context of the Engineering Drawing innovation. They were potential sources of arousal and the optimum of the "arousal potential" when crossed caused aversion to the innovation. It did not matter that we could not study all of these sources of arousal; nor did it matter that we could not get complete and accurate descriptions of them so long as we could at least discern their presence. Some of the points which we thought would occasion such a fund of arousal were as listed below:

1. The contrast or the similarity in the PASS RATES in the External Examinations before and after the introduction of the innovation. It was assumed that teachers, on the whole, attached great importance to Examination Results. The whole system of education in TAMIL NADU was "examination-dominated" (Adiseshiah, 1974). Indeed, in Asian countries generally, examinations dominated the educational process (The International Bureau of Education, 1972). For some teachers their feelings of professional success and possibly their career prospects depended on these results. It was also assumed that teachers attached importance to the validity of their own Internal Assessments of students' performance as predictors of success in the External Examinations.

2. The contrast or the similarity between the "model" of the innovation as presented by the innovators and its operation in practice.

3. The teachers' attitudes to the TRADITIONAL CURRICULUM <u>at the time</u> of our research and the conflict between these attitudes and the teachers' attitudes to the NEW CURRICULUM.

For the first point, there was not enough information available to us to make an analysis in depth of the Examination Marks. To study this question fully amounted to a curriculum evaluation exercise which was outside our research interests in the present study. It was, however, possible to formulate a hypothesis concerning the PASS RATES in 1972 and 1973 and to test it as we did in Chapter 5. The second point required us to leave the office and go in person into a number of Engineering Drawing classrooms in TAMIL NADU to observe the teaching-learning transactions taking place there and then. In other words, a FIELD STUDY was clearly necessary. This FIELD STUDY threw further light on the conditions surrounding the implementation of the innovation and provided us with vivid examples of resistance to change. For the third point it was assumed that the conflict and uncertainty experienced by teachers when confronted with the NEW CURRICULUM could be inferred from their attitudes to the NEW CURRICULUM and to the TRADITIONAL CURRICULUM, respectively.

3.6 THE RATIONALE FOR THE REPLICATION OF THE STUDY

The aim in replicating the study was to increase the "degree of confirmation" (Galtung, 1967) of our general hypothesis that there was a significant relationship between teachers' levels of Dogmatism and their attitudes to curriculum innovation. Although, as we report in Chapter 4, the findings in India had supported the hypothesis, the following question remained: were the findings in India merely an artefact of our "method" (i.e. of the units of analysis (the teachers), the method of data-collection, the variables, the range of values and the measures)? This is the question that we discuss in the present section. Since the Replication study was done in England, and not in India, we also examine the numerous difficulties commonly encountered in replicating social and educational research cross-nationally.

Galtung has proposed that hypotheses could be evaluated along a continuum. This continuum could be thought of as having at one extreme the "falsification" of hypotheses and at the other extreme the "verification" of hypotheses. These two extreme points were actually "useful fictions" but there were intermediate points along the continuum that were realistic: these were the "confirmation" and "disconfirmation" of hypotheses.

The "degree of confirmation" of a hypothesis in a particular investigation could be studied by examining each of four sources of variation in the process of acquiring data for testing the hypothesis, that is, the units of analysis, the variables, the values, and the method of data-collection. If a particular set of units, variables, values and method of data-collection were represented by one point in a four-dimensional space, and a hypothesis had been confirmed for this particular point, the question was how far out did we have to go in this four-dimensional space before there was a disconfirmation of the hypothesis? According to Galtung the answer to this question was to be found in the replication of the investigation. Replication was generic to all science (Smith, 1975) and the tenability of a particular hypothesis had therefore to be extended to other units of analysis, other methods of data-collection, other variables, and other ranges of values.

Now, Kerlinger (1973) has made a point which was pertinent to the present study, namely, that Replication was "particularly needed" in factor analytic studies; the 'reality' of factors, he said, was "much more compelling" if found in different samples. Moreover, as Oppenheim (1966) has observed, factor analysis opened the way to cross-national comparisons. However, we had to take cognisance of a number of difficulties in making cross-national comparisons. The results of cross-national survey researches were always subject to challenges to their validity (Verba, 1971). Differences or similarities in the patterning among measures (as revealed, for example, by factor analysis) were subject to the challenge that these differences and similarities were not "real"; they were artefacts of the research design. Such challenges were, of course, not limited to cross-national research. But, the fact that a study was carried out in different contexts increased the number of plausible alternative hypotheses. For example, if we were to find that the structure of the attitudes of the Indian teachers to curriculum innovation was different from the structure of the attitudes of the English teachers, this finding was subject to the challenge that the difference was merely a difference in, say, the administration of the questionnaires or in the wording of the questionnaire items. Or else, the argument could be made that curriculum innovation in the two countries was a different process altogether in terms of, for example, its organization or method of diffusion and that we had not in fact measured attitudes to the same "stimulus-object" (curriculum innovation) in each country.

Such challenges to the validity of cross-national survey research were "never fully answerable" (Verba, 1971). Thus, the problem of the <u>equivalent meaning</u> of our questionnaires across the two countries could not be easily disposed of: questionnaire items which were on the face of it similar might in fact not be equivalent in meaning because they could be given different subjective meanings by teachers in England and in India. However, the PRELIMINARY STUDIES (see Appendix D) which preceded the development of our attitude measures in India had included an open-ended questionnaire which was administered to a group of schoolteachers of Mathematics in England. The responses of that group to our unstructured questionnaire had been much of the same kind as those that we obtained from our interviews of the Indian teachers; the frankness of the teachers in England was just the same and the difficulties that they encountered when implementing innovation were blatantly similar and just as real to them. It seemed on the whole that what the innovation meant to them as teachers was much the same. And thus the teachers' responses made it convincingly clear to us that the events which the teachers in England and in India were describing were of a very similar type. We could, therefore, be reasonably certain that we were dealing with a similar phenomenon in the two countries. Furthermore, in developing our measures of attitude to curriculum innovation in India, the responses which we had collected from the teachers in England to our open-ended questionnaire were added to the richly textured set of responses that we had collected from our interviews in India itself. Together these different sets of responses formed the pool of statements from which we obtained items for the structured questionnaire about curriculum innovation which were ultimately used. We were, therefore, reasonably confident that any lack of equivalence in meaning between the structured questionnaire items that were presented to the English teachers and the questionnaire items that were presented to the Indian teachers had been reduced to the minimum possible in the circumstances.

However, it had to be admitted that the replication of the results obtained in India rested on the assumption that the questionnaire items about curriculum innovation that were presented to the teachers in India were also functionally equivalent to those used in England in spite of the differences in the innovative contexts. This assumption seemed reasonable for the second-level factors of attitude to curriculum innovation: at this level of generality attitudes to curriculum innovation were conceptualised in terms of broad tendencies to favour or oppose curriculum innovation. A second-level or group factor was a cause of co-variation which was more fundamental, more pervasive and more extensive than a first-level or specific factor. Admittedly, the teachers' responses were given to specific stimulus-statements about specific issues surrounding curriculum innovation; but the function of these statements was to index the underlying dimensions of attitude in the respective innovative contexts. It was assumed that although the specifics might vary from one innovative context to another, the underlying dimensions of attitude would not differ greatly at the second-level of factor analysis and that the function of the questionnaire items was equivalent in both contexts in that the same items would index the same dimensions. However, it was incumbent upon us to demonstrate that the corresponding second-level factors of attitudes to curriculum innovation in the two innovative contexts were in fact "congruent". Cattell (1973) has drawn attention to the abuse of functional equivalence by cross-cultural researchers who called concepts the same on face validity without any demonstration of typological similarity by factor measures.

Yet another consideration in our cross-national Replication study was also discussed by Verba (1971). Writing about cross-national studies in general, he pointed out that from the point of view of social science, "simple comparisons" across societies, such as comparisons of response rates to sets of questions, were "the least interesting" comparisons. He advocated instead comparisons of patterns of relationships among variables and comparisons of processes. Such "second-order comparisons" (Rokkan, 1964) had "greater substantive interest" and at the same time "greater methodological validity". They controlled for many of the contextual differences between societies and maintained the "contextual grounding" of the measures used. As Przeworski and Teune (1966) have said, in scientific research the goal was a set of statements concerning relationships between variables and cross-national analysis was an operation by which a relationship between two or more variables was stated for a defined population of countries. This was not to say that "simple comparisons" were pointless. Indeed, as Carver (1970) has argued (in the case of evaluation research) such "simple comparisons" could be quite informative. Thus, a simple comparison of the distributions of teachers' attitudes to curriculum innovation within each respective context was relevant and useful. But the point was that in the present study, Replication centred mainly around the relationship between Dogmatism and teachers' attitudes to curriculum innovation and, therefore, a "second-order comparison" of attitudes to curriculum innovation consisted in examining within each country the pattern of relations between the teachers' attitudes to curriculum innovation and Dogmatism when other independent variables in the study were controlled.

However, it could be argued that to relate teachers' attitudes to curriculum innovation to Dogmatism did not put the attitude variable very deeply into the context of the particular innovation or of the particular country because Dogmatism was a PERSONALITY variable and not a SITUATIONAL variable. But PERSONALITY was related to cultural determiners both in its current functioning and in its formation and Dogmatism was a phenotypic variable. Consequently, to relate our measures of attitudes to curriculum innovation to Dogmatism was to some extent to put the attitude variables into the socio-cultural contexts of the two countries.

But we had also to take into consideration the institutional contexts in which the respective innovations in India and in England were implanted. It seemed to us that variables like the teachers' experience of Bureaucracy were embedded into the institutional contexts of the innovations. Consequently, the pattern of relationships between such independent variables, Dogmatism, and the teachers' attitudes to curriculum innovation was examined in both countries. In this way, the intertwining of the variables <u>within</u> each country was used as the basis for a "second-order comparison" between the two countries.

But there were yet more considerations needing attention when replicating a study and some of these considerations are now examined.

3.6.1 GENERAL CONSIDERATIONS FOR THE REPLICATION PROCEDURES ON THE UNIT SIDE

The units of analysis in the present study were the teachers. Eichholz and Rogers (1964) have decried the tendency in numerous studies of innovation in education to take the unit of analysis as the school or as the school system; they have argued that as a consequence, much of the variation in innovativeness and in other characteristics between individual teachers was cancelled out. They advocated taking individual teachers instead as the units of analysis. Since the present study was mainly concerned with the co-variation of teachers' attitudes to curriculum innovation with their resistance to change, the units of analysis were identified as the teachers themselves. However, the "general universe" (Sjoberg and Nett, 1968) of "TEACHERS-INVOLVED-IN-CURRICULUM INNOVATION for all areas of study, at all levels, in all types of educational organisations and in all countries could not be specified. It was an abstract, theoretical universe.

Moreover, Galtung's (1967) recommendation for the replication of an investigation on the unit side was not to start close to the original sample but to obtain units that were "far out" and see whether the findings in the base sample still held. He argued that the gain in degree of confirmation depended not only on the number of replications but also on the "span of heterogeneity" which a particular replication bridged. Indeed, as one moved away from the original units, replication "shaded into generalisation".

This line of reasoning was accepted in the present study. For practical reasons, such as cost and distance, it was impossible for us to replicate our findings in South India in another sample of teachers in India itself. The only replication which could be contemplated had to be done in England. However, at the time of our research, only one example of curriculum innovation could be found in England which centred on engineering at Technical College level and unfortunately, the study of that innovation had already been sponsored by an educational agency and had already begun (Barry, 1974). However, if we considered replication to bear some resemblance to multi-stage sampling (Galtung, 1967), then in the present study the sampling was in three stages. At the first stage we sampled from the countries of the world, at the second stage from the sectors of education within countries (i.e. from the Primary, Secondary/Technical, and Higher Education Sectors) and at the third stage from the teaching population within these sectors. With this multi-stage sampling model in mind, we turned to the Secondary Education sector in England and searched for a curriculum innovation which could be said to resemble in some important ways the curriculum innovation in TAMIL NADU. We found a curriculum innovation in Mathematics which seemed to come very close in complexity and magnitude to the Indian innovation in Engineering Drawing (see Appendix B) and presumed that such an innovation in Mathematics was just as likely to provoke conflict and to arouse in the teachers feelings of uncertainty with its concomitants of anxiety and resistance to change. Consequently, on the unit side of the Replication it was possible to have a wide "span of heterogeneity" and to bridge two quite distinct populations: the teachers of Engineering Drawing in the Polytechnics of South India and the teachers of Mathematics in the Secondary Schools of England.

3.6.2 GENERAL CONSIDERATIONS FOR THE REPLICATION PROCEDURES ON THE VARIABLE SIDE

An important consideration for replication on the variable side was the distinction between vertical replication and horizontal replication.

Vertical Replication

As we have seen, Intervening Variables were close to the empirical data and Hypothetical Constructs were deeper within the nomological net. Putting it differently, Hypothetical Constructs were higher up in the hierarchy of variables: they were higher level variables whilst Intervening Variables were lower level variables. Given this hierarchy of variables then, vertical replication in the present study might have consisted in showing that the observed relationships between Dogmatism and teachers' attitudes to curriculum innovation in the TAMIL NADU sample were replicable at both levels in the ENGLISH sample, that is, at the first-level and second-level factors of attitudes to curriculum innovation. However, as in India, our major concern in the Replication Study was with the relationships between Dogmatism and teachers' attitudes to curriculum innovation when these were measured at a high level of generality, and, therefore, only at the level of the second-level factors. But as we have already indicated in order to compare the correlations between Dogmatism and the second-level factors of attitudes in the two countries, the same indicants of these factors had to be used.

Horizontal Replication

The aim in horizontal replication (Galtung, 1967) was to bring into the replication study other variables (within a particular group of variables) which were sufficiently close to the original set of variables as indicated by the size of the correlation coefficients; these had to be of "medium level" ($r = 0.7$ to 0.8). The reasoning was that the degree of confirmation of a hypothesis was increased if " more or less the same correlation" as that obtained between a dependent variable, say (Z), and an independent variable, say (X), in the original study was observed between the same dependent variable (Z) and a new independent variable (Y) that had itself a "medium level" correlation with (X). The argument that the findings of the original study were not an artefact of the choice of variables, had then an increased tenability. Now, in the original study in India, the dependent variables (Z) were the second-level factors of attitudes to curriculum innovation. The independent variables were a number of SITUATIONAL variables (see Chapter 4) and a PERSONALITY variable (Dogmatism). However, the Replication Study was essentially concerned with the correlations between Dogmatism and teachers' attitudes to curriculum innovation (Z). If therefore we considered Dogmatism as an independent variable (X), it was a matter of searching for another independent variable (Y) which had a "medium level" correlation with (X).

Now, having taken Dogmatism to be a PERSONALITY factor (Vacchiano, 1968), we had to search for another personality variable which had "medium level" correlation with Dogmatism. Vacchiano's own study of the correlations between Dogmatism and 59 personality scales had shown that the correlations were low ($r < 0.6$). The factorial study of Dogmatism by Rokeach and Fruchter (1956) had established that Dogmatism correlated with Adorno's (1950) Authoritarianism Scale F ($r = .64$) and with Gough's Rigidity Scale ($r = .62$). These were the highest correlations observed between Dogmatism and other personality variables and yet they fell short of the required "medium level" correlation of 0.7 to 0.8. Indeed, Rokeach had argued that Authoritarianism (as measured by the F scale) and Rigidity were both discriminable from Dogmatism; they were different dimensions of personality (see Chapter 2).

For these reasons, it was not possible to replicate the findings of the original study in India using any other personality variable than Dogmatism itself. Yet, as we have already explained, in an attempt to comprehend better the relation between RESISTANCE-within-PERSONALITY and teachers' attitudes to curriculum innovation, the present study was extended to include other PERSONALITY variables, namely, Rigidity, Neuroticism and Extraversion.

In this chapter then, we have provided our rationale for the various procedures that were adopted in the present study. In Chapters 4, 5, and 6, we give details of the actual procedures themselves together with the results of our analyses.

CHAPTER 4

The PROCEDURES and RESULTS for the study of the correlates of the teachers' attitudes to curriculum innovation in SOUTH INDIA.
(STAGE A, PART I)

4.1 INTRODUCTION

In the present chapter we report only our procedures and results for PART I of the investigations at STAGE A (see chapter 1, Figure 1.1), that is, for the study of the correlates of teachers' attitudes to the curriculum innovation in Engineering Drawing in SOUTH INDIA.

The chapter describes in some detail the general procedures for studying teachers' responses to curriculum innovation in Engineering Drawing, the procedures that were adopted for the first-level and second-level factor analyses of these responses, and the procedures for estimating the relative contributions of PERSONALITY and SITUATIONAL variables to the variations in the teachers' attitudes to curriculum innovation in India.

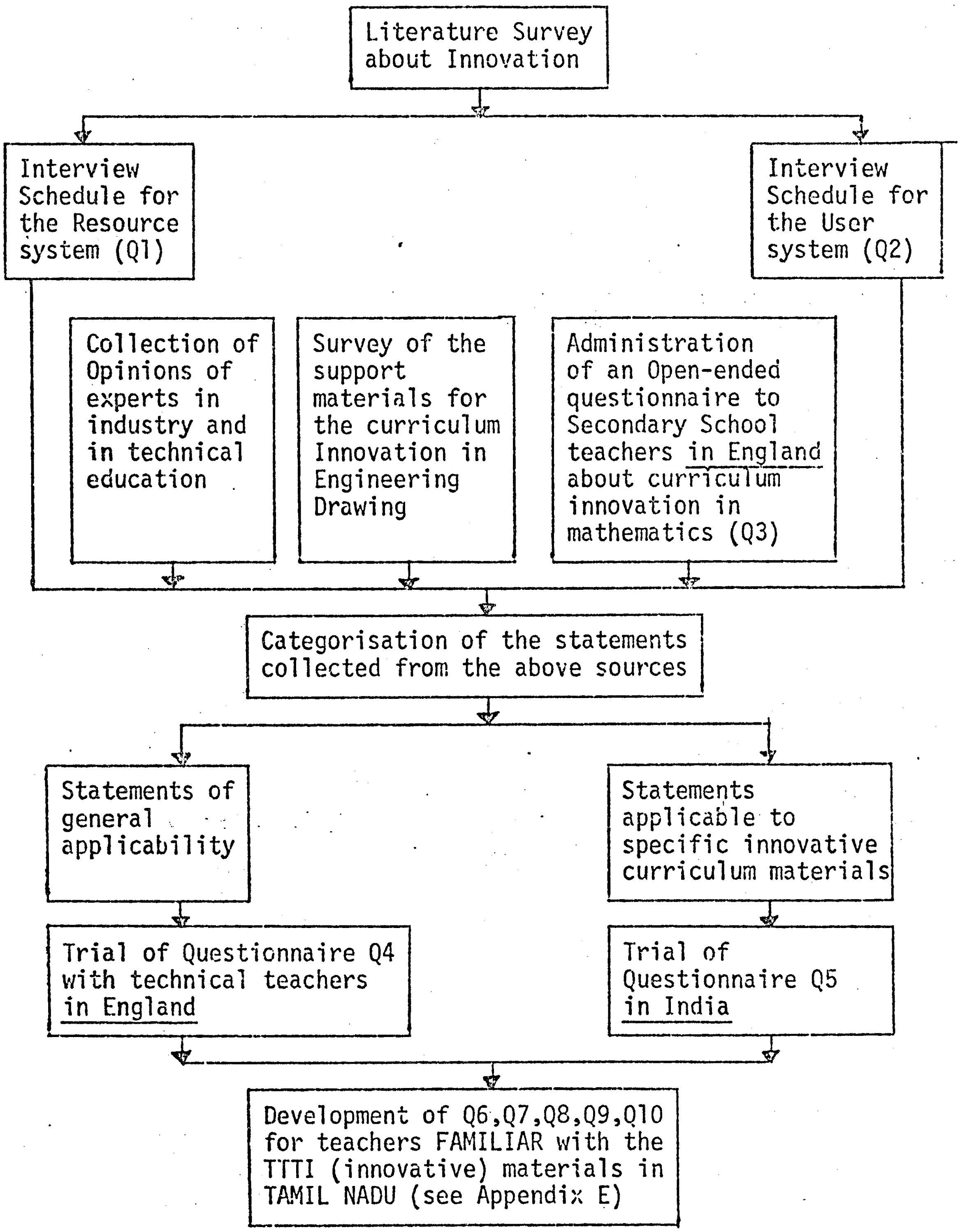
4.2 THE GENERAL PROCEDURES

4.2.1 THE OVERALL PLAN FOR THE DEVELOPMENT OF THE QUESTIONNNAIRES USED IN INDIA.

Figure 4.1 shows our overall plan for the development of the questionnaires used in India and Appendix C puts our procedures in a chronological order. However, our first task when we arrived in India was to discuss with our Indian colleagues at the Technical Teachers Training Institute, Madras, the basic organization pattern for the initiation, development and diffusion of the Engineering Drawing curriculum innovation in SOUTH INDIA. In this way we were able to locate the various groups of persons involved in the innovation-diffusion system and decide on how to get access to them for the development of our questionnaires.

FIGURE 4.1

STEPS IN THE DEVELOPMENT OF THE QUESTIONNAIRES USED IN INDIA



NOTE:

a. Q6 and Q7 were also intended for teachers who were NOT FAMILIAR with curriculum innovation and who were teaching in three other states of SOUTH INDIA.

b. See Appendix E for Q3, Q4 and Q5.

4.2.2 THE SAMPLING PROCEDURES

The overall innovation - diffusion system was conceptualised as being made up of two main parts (Figure 4.2):

a. the RESOURCE sub-SYSTEM, and

b. the USER sub-SYSTEM.

The RESOURCE sub-SYSTEM was made up of those individuals who were actively involved in the work of the Curriculum Development Unit at TTTI, that is, in the preparation, development, dissemination and trial of the NEW CURRICULUM materials. The composition of the Unit had varied from time to time but in all six TTTI staff had contributed to the work of the unit and we were able to interview four of them.

The USER sub-SYSTEM was more complex; it was as shown in Figure 4.2. The users of the NEW CURRICULUM materials could be categorised as Teachers or Students, and as Actual or Potential; this classification yielded four distinct user groups. However, because our study was concerned with the attitudes of teachers (and not with the attitudes of students) to curriculum innovation, the development of our questionnaires, our sampling procedures, our hypotheses and subsequent analyses were only related to the two groups of teachers (i.e., the Actual and Potential Users).

This distinction between Actual and Potential Users was an important one. As we have mentioned already, in TAMIL NADU the innovation was implemented by order of the state DIRECTOR OF TECHNICAL EDUCATION in all the Polytechnics. We were given to understand that one teacher from each of these Polytechnics was quite sophisticated in the use of the innovative materials in the sense that he had attended one of the "CRASH COURSES" which aimed specifically at training him in the use of the TTTI materials. Each such sophisticated teacher was then joined by two or three unsophisticated teachers within his Polytechnic (depending on the size of the Polytechnic) and the team thus formed was responsible for implementing the innovation. The total number of teachers who participated in this way in the implementation of the innovation was estimated to be 96 (see Table 4.1). The teachers in TAMIL NADU were designated as the FAMILIAR teachers.

FIGURE 4.2

THE RESOURCE AND USER SUB-SYSTEMS: RELEVANT PARTS FOR THE STUDY OF THE TEACHERS' REACTIONS TO THE CURRICULUM INNOVATION IN ENGINEERING DRAWING IN SOUTH INDIA.

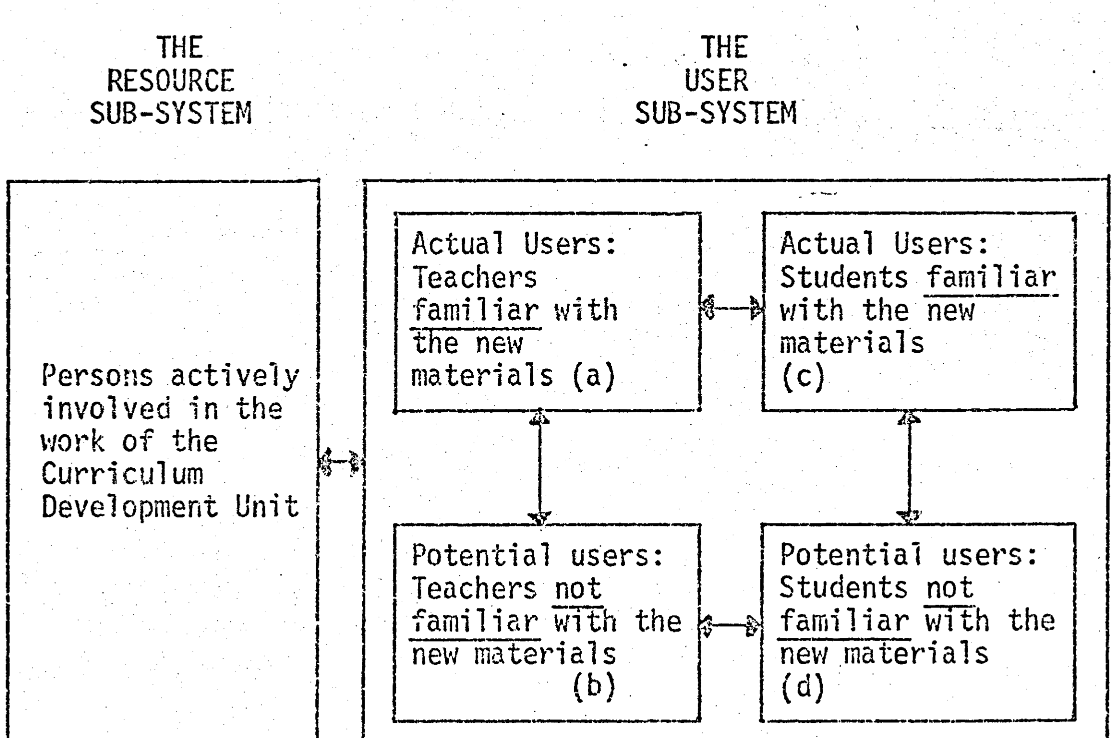


TABLE 4.1

THE ESTIMATED POPULATION OF MALE POLYTECHNIC TEACHERS OF ENGINEERING DRAWING AND THE RESPONSE RATE IN SOUTH INDIA (BY STATE, ATTENDANCE ON CRASH COURSES, AND USE OF THE INNOVATIVE MATERIALS)
(SEE ALSO APPENDIX F)

	STATE					
	TAMIL NADU			OTHER STATES (Mysore, Kerala, Andhra Pradesh)		
	Estimated Population	Number of respondents	Response Rate %	Estimated Population	Number of respondents	Response Rate %
Did not attend a CRASH COURSE and did not use the innovative curriculum materials	-	-	-	135	54	40%
Did not attend a CRASH COURSE but used the innovative curriculum materials	66	56	84.8%	57	17	29.8%
Attended a CRASH COURSE	30	24	80%	40	9	22.5%
Total	96	80	83.3%	232	80	34.5%

Note:

a. the number of respondents was obtained from the completed questionnaires that were returned.

b. The teachers in TAMIL NADU were designated as FAMILIAR in the text whilst those in the OTHER STATES were designated as NON-FAMILIAR.

Access to the population of FAMILIAR teachers was through meeting them personally at four REGIONAL CENTRES where it was administratively convenient to assemble them. Details of our procedures are given in our account of the FIELD STUDY in chapter 5. Eighty teachers completed the questionnaires that were administered during our visits to these Regional Centres giving an overall response rate of 83.3 per cent (Table 4.1). This sample of teachers was designated the MAIN FAMILIAR SAMPLE. It was the sample used for developing our measures of attitude to curriculum innovation and this is why it was appropriately called the main sample in the present study.

As for the Other Three States of SOUTH INDIA (Mysore, Kerala and Andhra Pradesh), as it appeared that no directives to adopt the TTTI materials were given by the Directors of Technical Education in these states, our immediate inference was to assume that the teachers in those states were NOT FAMILIAR with the innovative materials and we designated them as <u>NON-FAMILIAR</u> teachers. However, we found out later that the process of diffusion for the innovation was more complex than that.

What happened in fact was that a number of teachers from these OTHER STATES had also attended "CRASH COURSES" run by TTTI but were not compelled to adopt the innovation. Officially they were not users of the innovative materials, but in practice, it was possible that some among them had adopted some aspects of the innovation by using a few of the units of study in their lessons. Indeed, those teachers might even have become agents for the diffusion of the innovation in their own Polytechnics. However, the term NON-FAMILIAR was a quick and ready means of distinguishing between the teachers in TAMIL NADU where the innovation was mandatory and the teachers in the other STATES where it was not and the term NON-FAMILIAR was to remain attached to all the teachers in these OTHER STATES. The total population of Engineering Drawing teachers in these OTHER STATES was estimated to be 232 (see Table 4.1 and Appendix F).

In contrast to the elaborate - and costly! - procedure for the collection of the teachers' responses to curriculum innovation in TAMIL NADU, the procedure for the three OTHER STATES was administratively relatively simple. Distance, cost, the limited time at our disposal for the data collection, and our wish for a reasonably high representation of teacher opinion, all these taken together dictated that teachers in the OTHER STATES could only be contacted by mail.

However, very fortunately, we were able to approach in person the Directors of Technical Education for these three states, when they came to Madras on official business. They were visiting the TTTI and we were able to obtain their permission to post the questionnaires to their staff in the Polytechnics. They even sent a circular letter round to the Polytechnics asking teachers to co-operate with us by completing and returning the questionnaires to us.

On the advice of Indian colleagues at TTTI and from the very limited information available to us about the Polytechnics in the three OTHER STATES, a set of the questionnaires was posted to the Principal of every single Polytechnic with a request to have these questionnaires completed by his teachers of Engineering Drawing and returned to us as early as possible. Stamped addressed envelopes were enclosed. Ten days later a reminder was sent to the teachers, again through the Principals.

However, in spite of the official support that we received, the overall response rate in the three OTHER STATES was lower than what we had hoped for. Altogether, 88 completed questionnaires were returned giving a response rate of 37.9% (see Table 4.1); unfortunately, eight of these were invalidated by omissions or by incorrect completions of the questionnaires so that for the purpose of the data analysis which was to follow, the response rate fell to 34.5%. This was the extent to which the sample was representative of the population of Engineering Drawing teachers in the OTHER STATES. Actually, a breakdown of the number of respondents per state showed that the states of Mysore and Kerala were represented to the extent of approximately 41% and 39% respectively (see Table 4.2) whereas in the state of Andhra Pradesh the response rate was only about 22%.

TABLE 4.2

THE RESPONSE RATE FOR THE NON-FAMILIAR TEACHERS (BY STATE)

		NON-FAMILIAR teachers				
		MAJOR SAMPLE	MINOR SAMPLE	TOTAL BY STATE	ESTIMATED POPULATION	RESPONSE RATE (% by state)
STATES	Mysore	27	14	41	100	41
	Kerala	18	4	22	56	39.3
	Andhra Pradesh	9	8	17	76	22.4
TOTAL (by sample)		54	26			

Now, the distinction that was ultimately made <u>within</u> our sample of respondents from these OTHER STATES was between the teachers who were "truly" NOT FAMILIAR with the innovation and the rest. The "truly" NON-FAMILIAR teachers were those who had never used the innovative materials (although they might have seen them) and in addition, had not attended a CRASH COURSE (cells b and d, in Figure 4.3). On the other hand, teachers who had used the innovative materials (cells e, f, g, h, in Figure 4.3) had varying degrees of FAMILIARITY with the innovative materials. The former sub-group was larger and was labelled the MAJOR NON-FAMILIAR SAMPLE (n = 54); the latter group was labelled the MINOR NON-FAMILIAR SAMPLE (n = 26). However, our analyses in India were not concerned with the MINOR NON-FAMILIAR SAMPLE. In point of fact, the analyses were concerned with only two groups: the teachers in the MAJOR NON-FAMILIAR SAMPLE and teachers in the MAIN FAMILIAR SAMPLE.

There was a net numerical bias in favour of the state of Mysore (Table 4.2) in the MAJOR NON-FAMILIAR SAMPLE. However, the response rates for Mysore and Kerala were probably as good as might be expected under the conditions that we have described for collecting the teachers' responses. It was Andhra Pradesh which was grossly under-represented. The much lower response rate for Andhra Pradesh must mean that there were factors which deterred teachers in that state from responding to our questionnaire; what these factors might be we just did not know.

From the above account of the data collection, it can be seen that the sampling of the NON-FAMILIAR teachers was done at the processing stage; it was just not possible to obtain enough information about the teachers to plan a proper sampling procedure for representativeness of the population before collecting the data; Burroughs (1971) has

FIGURE 4.3

CLASSIFICATION OF INDIAN TEACHERS BY FAMILIARITY AND ATTENDANCE ON COURSES (SEE ALSO APPENDIX F)

		ATTENDANCE ON COURSE (Q6.5)	
		YES	NO
FAMILIARITY (Q6.4)	VERY UNFAMILIAR	a	b
	QUITE UNFAMILIAR	c	d
	QUITE FAMILIAR	e	f
	VERY FAMILIAR	g	h

NOTE:

1. Questionnaire Q6 (Item 4) explains that:

"Very unfamiliar" applied to teachers who had never seen the innovative materials or who did not know anything about these materials.

"Quite unfamiliar" applied to teachers who had seen the materials but had never used them

"Quite familiar" applied to teachers who had used some units of the materials.

"Very familiar" applied to teachers who had used most of the units of the materials.

2. It was logically impossible to have teachers in Cell (a); as Appendix F showed, the TAMIL NADU teachers (the MAIN FAMILIAR SAMPLE) were in cells e, f, g, h; the MAJOR SAMPLE of the NON-FAMILIAR teachers were in cells b and d; the MINOR SAMPLE of the NON-FAMILIAR teachers were in cells c, e, f.

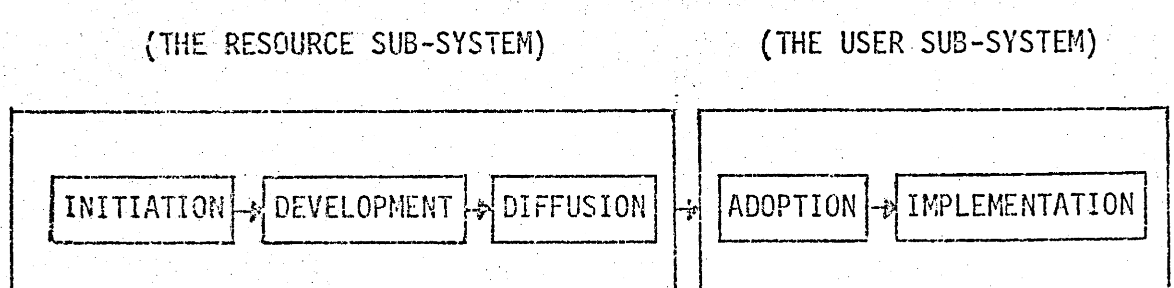
pointed out that there was much to be said for this approach since the problem of drop-outs and the problem of the "chosen few" were both reduced by this procedure. We felt that the latter point was particularly important when one was dealing not with school pupils and college students (as was common in educational research!) but with semi-professionals: some teachers might be particularly sensitive to being included among the "chosen few" and being asked to make evaluative judgements about professional issues (in spite of the anonymity of their responses). And in an authoritarian system like the one which obtained in India, a research which already had official support might have resulted in a distortion of the responses of the "chosen few".

4.2.3 PROCEDURES FOR THE PRELIMINARY STUDIES

Appendix D gives an account of our procedures for our Preliminary Studies in some detail. However, a particularly important strategy for the development of our questionnaire was the elaboration of the relationships between the RESOURCE SUB-SYSTEM and the USER SUB-SYSTEM in the process of curriculum innovation. This process was modelled in chapter 2 and the result of our elaboration was the model shown in Figure 4.4 below.

FIGURE 4.4

THE PLACE OF THE RESOURCE AND USER SUB-SYSTEMS IN THE PROCESS OF CURRICULUM INNOVATION



The model served as a useful framework for the construction of our INTERVIEW SCHEDULES for individuals in the RESOURCE and USER SUB-SYSTEMS respectively. It enabled us to ask questions to our interviewees about the various stages in the process of curriculum innovation. Great importance was attached to these interviews because they were to be a major source of statements by individuals who had been actually involved with the innovation in India and who presumably said what was uppermost in their minds at the time; certainly, ideas were expressed spontaneously and such spontaneity was in our view extremely worthwhile.

4.2.4 THE QUESTIONNAIRE ABOUT CURRICULUM INNOVATION

The statements that were obtained from various sources during our PRELIMINARY STUDIES were gathered together and their content analysed. This analysis yielded approximately 300 statements but when these were categorised, it became evident that a number of them were redundant and we were left with 74 to map the universe of content for teachers' attitudes to curriculum innovation. This number seemed to be about right because of the total likely length of the complete booklet of questionnaires when other questionnaires (that is, those for the "independent" SITUATIONAL and PERSONALITY variables) were all assembled together.

The need to obtain an estimate of the amount of variance in teachers' attitudes to curriculum innovation that could be explained by FAMILIARITY forced upon us certain modifications not only in the standard procedures for deriving second-order factors of attitudes but also in the very format of our questionnaire about curriculum innovation. The point was that the teachers in

SOUTH INDIA who were NOT FAMILIAR with the Engineering Drawing innovation in TAMIL NADU could not be expected to respond to stimulus-statements which were highly specific to that particular innovation. Indeed, even for the FAMILIAR teachers in TAMIL NADU, because we wanted to compare their attitudes to existing curriculum materials other than the TTTI ones (that is, mostly the traditional curriculum materials prior to the innovation) and their attitudes to the new curriculum (TTTI) materials, we had to present to the Indian teachers a questionnaire which contained only those stimulus-statements that could be applied meaningfully to both curricula.

For these reasons the questionnaire was split into three sections (X_1, X_2, X_3,) as follows:-

X_1: This was a section containing items about curriculum innovation in general; both FAMILIAR teachers and NON-FAMILIAR teachers were expected to complete this section.

X_2: This was a section containing items which could be meaningfully applied to the old or TRADITIONAL CURRICULUM in Engineering Drawing as well as to the NEW (TTTI) CURRICULUM but which could only be completed by the FAMILIAR teachers.

X_3: This was a section containing items which could only be meaningfully applied to the NEW (TTTI) CURRICULUM course materials, and which could be completed only by the FAMILIAR teachers.

As Appendix E shows, section X_1 was denoted in the text as sub-questionnaire Q7 and section X_2 as Q8. Actually, Q7 and Q8 were the final forms of these two sections. In fact, as Figure 4.1 shows, Q4 and Q5 were our initial attempts at designing these sections and were prepared before our second visit to India. (See Appendix C). Once we were back in Madras for that second visit, colleagues from the Education Research Unit at TTTI were invited to go through these lists of items and to examine them critically. This scrutinization was necessary in order to adjust the clarity of the items to the Indian context. After a number of modifications in phraseology, mode of response, and order of items, the new lists of screened items were labelled Q7 and Q8.

We also discussed with our TTTI colleagues in the Education Research Unit the possible items to include in Section X_3. This was made up of two sub-parts: Q9, which attempted to assess the perceived degree of innovativeness of the innovation in Engineering Drawing and Q10, which was about yet more features of the innovative materials. However, only Q10 was to figure prominently in our subsequent analyses because Q9 was highly specific to the TTTI materials and the items could not be applied to the innovation in Secondary School Mathematics for our Replication Study in England. The objective for including Q9 was simply to check on the degree of innovativeness of the TTTI materials; it was meant to inform us whether the TTTI materials were in fact seen to be innovative by the teachers.

The 74 items or stimulus-statements which originated from our PRELIMINARY STUDIES were thus allocated to different sections according to their item content. These sections were then assembled to form the questionnaire about curriculum innovation (see Q7 to Q10 in Appendix E).

A five-point Likert (1932) type of scale (from "strongly agree" to "strongly disagree") was used for obtaining the teachers' ratings of the statements in the sub-questionnaires Q7, Q8 and Q10. The disadvantages of the Likert scale were acknowledged. For example, the neutral point on the scale was not necessarily the midpoint and the same total score for a set of items could be obtained in different ways. But since the intention was to develop scales using an internal-consistency method of item-analysis, these disadvantages lost some of their importance.

However, in order to prevent the respondents from getting bored with the same mode of response, a different type of scale was adopted for sub-section Q9. The format was inspired by the Semantic Differential technique (Osgood, 1957) but using the one and same bipolar adjectival scale (Innovative-Coventional) for the evaluation of eight "concepts" relating to the innovative materials. It was a seven-point scale.

The questionnaire about curriculum innovation was not piloted in the target population (i.e. the Engineering Drawing teachers in TAMIL NADU). Pretesting was a frequent practice in the development of instruments; it was helpful in discovering ambiguities. However, since the nature of the information sought by our questionnaire could be biased by prior exposure to it, we would have had to exclude from our final sample of Engineering Drawing teachers those individuals who had been selected for the tryout of the questionnaire; and since the estimated number of these teachers was only 96, the group of teachers for a pilot study would have had to be very small. Consequently we decided against such a pilot study because of the instability of inter-item correlations in small samples. Moreover, the teachers were dispersed over a very wide geographical area making it impossible in any case to have a random sample for a pilot study in the circumstances.

As for the teachers in the OTHER STATES, of all the sections of the questionnaire about curriculum innovation only one (Q7, a section about curriculum innovation in general) could be responded to by them. For example, an item like:

> "It is a waste of time for the instructor/lecturer to try new ideas unless the Head of Department approves of them" (Q7, Item 16)

was one of general applicability. We could assume that it was meaningful to teachers even if they had not been involved in the specific, TTTI curriculum innovation in Engineering Drawing at the time; the teachers could be expected to respond intelligently to it. On the other hand, items which implied a knowledge of specifics about the particular curriculum innovation in TAMIL NADU could not be responded to by teachers in the OTHER STATES unless somehow they had had access to the innovative curriculum materials. An item like:

> "There is an attempt to relate the topics covered in the course materials closely to industrial drawings" (Q8, item 1).

was such a one.

4.2.5 THE SCORING PROCEDURES FOR THE QUESTIONNAIRE ITEMS ABOUT CURRICULUM INNOVATION.

A. For Sections Q7, Q8, Q10

To begin with, raw scores were obtained from the teachers' original responses to the questionnaire items. These scores were used for computing the product-moment inter-item correlations for each section of the questionnaire and these correlations were factor analysed; no attention was paid at this stage to the direction of scoring, because that would have involved introducing our own subjective interpretations of the statements into the procedures.

However, after factors were extracted from the inter-item correlations and rotated, and after each factor was identified by a cluster of defining items, the direction for scoring each item was examined in order to calculate the average inter-item correlations (and hence, the alpha coefficients) and the factor scores for each composite variable. The direction for scoring was done either "normally" or in reverse. For the normal direction of scoring a score of 1 was given for strong agreement with a statement which was unfavourable to the attitude underlying the cluster of items and a score of 5 was given for strong agreement with a statement which was favourable to the same attitude. It followed that for the reverse direction of scoring, a score of 5 was given for strong disagreement with a statement which was unfavourable to the attitude and a score of 1 for strong disagreement with a statement which was favourable to that same attitude.

As a consequence of adopting these scoring procedures, the signs for the inter-item correlations had to be altered in some instances before proceeding with the calculation of the average inter-item correlation for each cluster of items.

The next stage in the procedures was to score those items that did not belong to any clusters; for these, the direction of scoring was inevitably purely subjective and was in terms of a general support for or opposition to curriculum innovation. The normal direction of scoring in these cases was a score of 1 for strong agreement with a statement which would generally be taken as unfavourable to curriculum innovation and a score of 5 for strong agreement with a statement which would seem in general terms to favour curriculum innovation. The reverse direction of scoring derived from that: 5 for strong disagreement with a statement generally accepted as being unfavourable to curriculum innovation and 1 for strong disagreement with a statement which seemingly favoured curriculum innovation. In practice these scoring procedures were not as cumbersome as they might appear to be!

B. For Section Q9

In this section, the raw scores were a direct record of the degree of innovativeness of the TTTI materials as judged by the teachers themselves. The only element of subjectivity on our part was to allot a high score of 7 to those features of the materials which were seen by the teachers as very "innovative" and a low score of 1 to those features that were seen as very "conventional". In practice, this meant that the items were all scored in the reverse direction because of the lay-out of the items in that section.

4.3 THE ANALYTICAL PROCEDURES

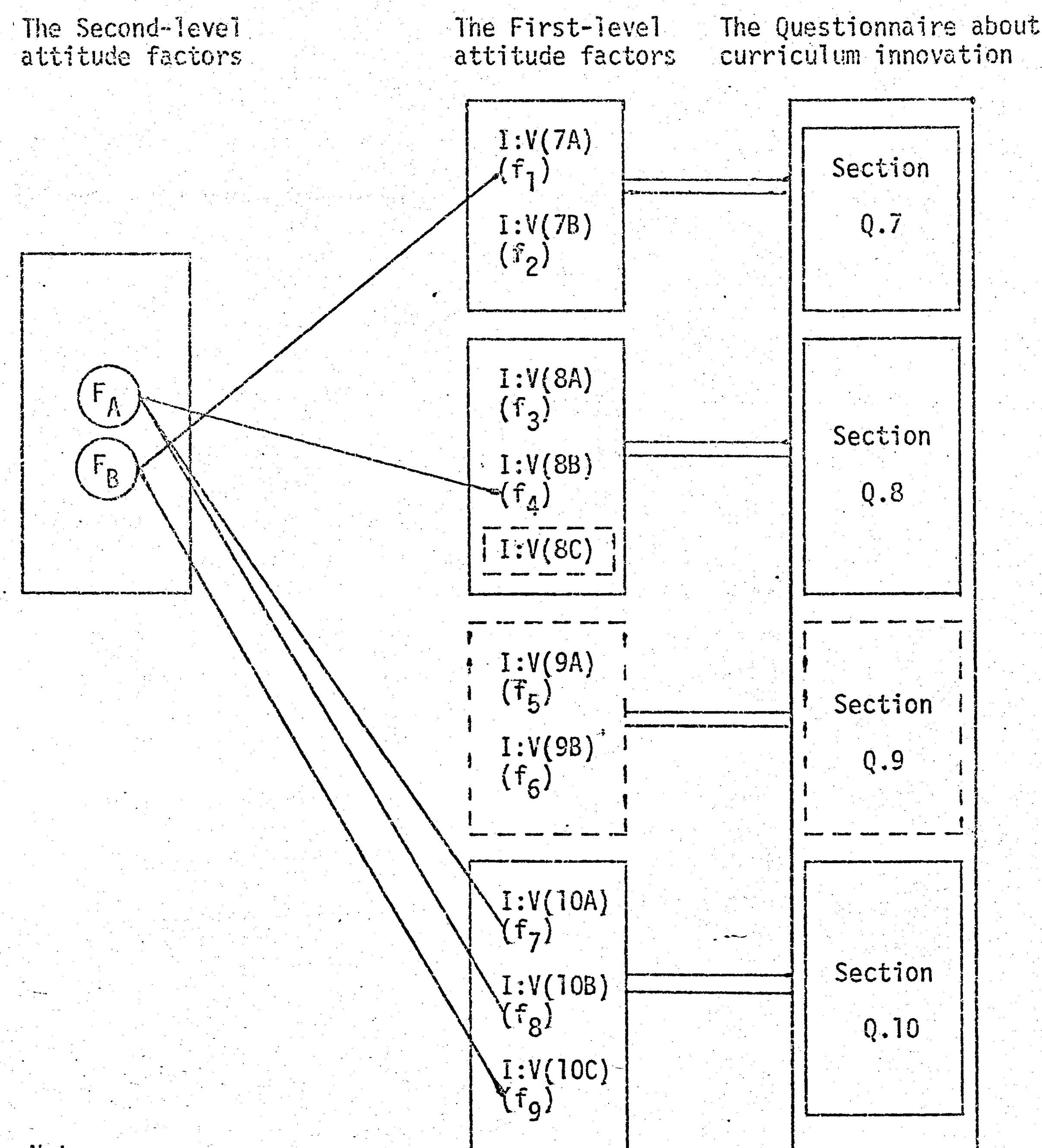
Figure 4.5 depicts our approach to the construction of reliable attitude scales by factor analysis. As already indicated, for the second-level factor analysis, because the items in Section Q9 were specific to the Engineering Drawing innovation and were therefore not applicable to the innovation in Mathematics in England, the first-level factors from Q9 were discarded for the purpose of that analysis.

4.3.1. THE INTER-ITEM CORRELATION ANALYSES

The product-moment inter-item correlations for each section of our our questionnaire (Sections Q7, Q8, Q9, Q10 respectively) were calculated irrespective of the shape of distributions for the items, that is, whether the distributions were normal or not. As Borgatta (1962) has pointed out, the assumption of normality was with reference to underlying dimensions and not to particular access variables for those dimensions. It was assumed here that if more than one item or variable was utilized for measuring the underlying dimensions the asymptotic normal properties would manifest themselves. McKennell (1965) has remarked that in the use of correlation coefficients departures from the assumptions of the ideal model (that is, from assumptions of normality and of linearity) had to be quite large before significant and strong associations between variables failed to be reflected in the values of the product-moment correlation coefficients. Furthermore, in our item analyses we were not using the product-moment correlation (r) for an accurate determination of the proportion of variance in one variable that was predictable from or attributable to the variation in another variable. Admittedly, when making such specialised interpretations of the

FIGURE 4.5

THE EXTRACTION OF FIRST-LEVEL AND SECOND-LEVEL FACTORS FROM DIFFERENT SECTIONS OF THE QUESTIONNAIRE ABOUT CURRICULUM INNOVATION.



Note:

a. The labels I:V(7A), I:V(7B), and so on, were used in the text for the first-level factors themselves; the labels f_1, f_2, and so on, were used for the composite variables formed by the items which defined the first-level factors.

b. The composite variable which represented I:V(8C) had a reliability of less than 0.5 and was therefore not used in subsequent analyses.

correlation coefficient we had to be careful that we were not departing substantially from the assumptions of the ideal model. But here we were simply using the correlation coefficients for the clustering of items. Moreover, Keown and Hakstian (1973) have shown that the Pearson r was a relatively robust measure of association for Likert scale items.

4.3.2 THE FIRST-LEVEL FACTOR ANALYSES

The factor analyses that followed the inter-item correlation analyses were all done using the IBM program (1130 Statistical System) that was available at Huddersfield Polytechnic. For each section of the questionnaire, a Principal Components Analysis was first done and this was followed up by a Varimax rotation of a chosen number of factors. (Fruchter, 1954; Harman, 1967; Hope, 1968; Child, 1970). Since our interest was in "exploratory" factor analysis and not in "confirmatory" factor analysis, the new methods for maximum likelihood factor analyses (Joreskog and Lawley, 1968) were not used; in any case, no computer programs for these methods were available at the time.

Our decision on the number of factors to be rotated was informed by Kaiser's criterion and by the "scree test" (Cattell,1966). On the basis of Kaiser's criterion, factors with latent roots greater than 1 could be chosen because they were considered to be factors that could be said to be common. However, we found Cattell's "scree test" useful at times. It was a quick and convenient test; unfortunately, as Cattell himself recognised, the test was not entirely worked out in its theoretical statistical basis. Nevertheless, it was a matter of common observation that when successive factors in a factor analysis were plotted against the size of the corresponding latent roots, the curve fell in a curvilinear fashion and then became straight. Cattell thought that when successive latent roots began to fall with such regularity we could infer that we were dealing only with common factors which were due to a large number of random small influences. Consequently, the point at which the curve straightened out could be taken as the maximum number of factors to be rotated. However, whilst both these procedures were considered, our decision on the number of factors to be rotated was also influenced by the need to rotate only the factors with the larger latent roots because these were probably reasonably stable against changes in the conditions of curriculum innovation in different countries. Moreover, the inter-item correlation matrix for each section of the questionnaire was also inspected to see whether the items within the clusters (derived from the factor analysis) had higher correlations with each other than with the items outside the cluster in the same section of the questionnaire.

Thus, Factor Analysis was not a straightforward methodology; it was not stripped of its subjectivity as Kaiser (1958) had hoped!

For each section of the questionnaire, the results of the factor analysis were used to cluster the items in that section. Items with factor loadings just short of 0.4 and above were relied on exclusively to characterize each Varimax factor. Loadings as low as 0.3 could be significant at the one per cent level using the Burt-Banks formula (Child, 1970) with our sample size and number of items. However, low loadings were liable to obscure the picture rather than clarify it, whereas the larger the loading the more the item had in common with other items with high loadings and the more it measured the factor. Consequently each item was assigned to the factor on which it had the highest loading and items which had the highest loadings on a factor were taken to be the defining items for that factor.

The reliability (homogeneity) of each cluster of items which represented a first-level factor was determined by calculating the alpha coefficient. The "reliable" clusters or composite variables were labelled as shown in Figure 4.5 (that is, f_1 to f_9).

4.3.3 THE SECOND-LEVEL FACTOR ANALYSIS

The simple product-moment inter-correlations of the composite variables were subjected to a factor analysis. The procedures for this analysis were the same as for the first-level factor analysis of the inter-correlations of single items; that is to say, a Principal Components Analysis model rather than an orthodox factor analysis model was utilized with unities rather than communality estimates placed in the main diagonal. This analysis was followed by rotation towards orthogonal simple structure by the Varimax procedure. The number of factors to be rotated was dictated by the same considerations again. However, there was also the principle of parsimony to consider. It was a well established principle that science strove for parsimony of explanation (Smith, 1975), and in this instance the aim was to explain the common factor variance by as few meaningful factors as possible.

4.3.4 THE SCORING PROCEDURES FOR THE SECOND-LEVEL FACTORS

As explained in chapter 3 (see also Figure 3.2), the necessity to replicate our study in England influenced our scoring procedures. Both the "complete" and incomplete" methods of factor scoring were used.

Taking the "incomplete method" first, for each factor, the salient composite variables with high loadings (that is, just short of or above 0.4) were weighted; the weighting was done by multiplying the standardised score for each marker composite variable by the factor loading itself. Factor scores were then obtained by summing up the weighted scores of the constituent marker variables. The equations used for calculating these factor scores are given below in Figure 4.12, p.199. There was thus a marked difference in the summation procedures adopted for scoring the composite variables which represented the first-level factors and the summation procedures adopted for scoring the second-level factors. The point here was that for the first-level factors, the summation was that of scores for single items which had roughly similar variance. But for the second-level factors, because the marker composite variables were themselves composed of different numbers of items and therefore different in variance, the scores for these marker variables had to be standardised before summation (Guilford, 1956). The "complete method" entailed weighting the scores of all the composite variables that were used originally for the second-level factor analysis (and not only the scores for the marker composite variables) before summing them up. These operations were performed automatically by the IBM computer program from the data that was fed in for the second-level factor analysis and factor scores were obtained as part of the output statistics.

The results in Section 4.4 below show that two second-level factors were extracted. These were designated as F_A and F_B respectively. They were represented by the composite variables F_A' and F_B' respectively.

4.3.5 THE PROCEDURES FOR THE MULTIPLE CORRELATION ANALYSES.

Three Multiple Correlation Analyses were done in India and aspects of these analyses are contrasted in Figure 4.6.

a. Multiple Correlation Analysis (I)

For this analysis the sample was the MAIN FAMILIAR SAMPLE (n = 80) and the dependent variable was F'_A.

b. Multiple Correlation Analysis (II)

For this analysis, the sample was again the MAIN FAMILIAR SAMPLE but the dependent variable was F'_B.

c. Multiple Correlation Analysis (III)

For this analysis the sample was different; it was made up of the teachers from the MAIN FAMILIAR SAMPLE (n = 80) together with the teachers from the MAJOR NON-FAMILIAR SAMPLE (n = 54) and was designated as the COMBINED GROUP. The dependent variable was also different; it was the first-level factor (f_1) (see below)

The Multiple Correlation Analyses I and II

For the sake of brevity, the procedures for Analyses I and II are reported together because they were essentially the same.

The question which was examined by these two Multiple Correlation Analyses had three facets as follows:-

1. Did each independent variable in our explanatory framework correlate significantly with each of the two second-level factors of teachers' attitudes to curriculum innovation (as measured by the variables F'_A and F'_B respectively)?

2. How much of the variance in each of the two second-level of attitudes to curriculum innovation could be accounted for

FIGURE 4.6

THE CONTRASTING ASPECTS OF THE THREE MULTIPLE CORRELATION ANALYSES THAT WERE DONE IN INDIA

<table>
<tr><th colspan="3" rowspan="2"></th><th colspan="3">Multiple Correlation Analyses (I) and (II)</th><th colspan="3">Multiple Correlation Analysis (III)</th></tr>
<tr><th>Designation of sample</th><th>Size of sample (n)</th><th>Dependent Variables</th><th>Designation of sample</th><th>Size of sample (n)</th><th>Dependent Variable</th></tr>
<tr><td rowspan="4">Categories of teachers by FAMILIARITY with the innovation in Engineering Drawing</td><td rowspan="2">FAMILIAR teachers</td><td>Very Familiar</td><td rowspan="2">MAIN FAMILIAR SAMPLE</td><td rowspan="2">80</td><td rowspan="2">F'_A and F'_B</td><td rowspan="4">COMBINED GROUP (that is, Main FAMILIAR SAMPLE and MAJOR NON-FAMILIAR SAMPLE)</td><td rowspan="4">(80) + (54) = 134</td><td rowspan="4">f_1</td></tr>
<tr><td>Quite Familiar</td></tr>
<tr><td rowspan="2">NON-FAMILIAR teachers</td><td>Quite Unfamiliar</td><td colspan="3" rowspan="2"></td></tr>
<tr><td>Very Unfamiliar</td></tr>
</table>

Note: The independent variables (other than FAMILIARITY) were the same for the three analyses.

Key (see Section 4.4 below):

F'_A = Support for the design, content and teaching requirements of the new curriculum.

F'_B = Belief in the professional competence of teachers for initiating and implementing curriculum innovation

f_1 = Belief that teachers should take the initiative in curriculum innovation.

by variations in each independent variable when other variables were partialled out?

3. For each of the two second-level factors of attitude what were the possible independent variables which would fit into the proposed causal models discussed in chapter 3?

The first two of these facets led to the formulation of a specific statistical sub-hypothesis as shown below. The third facet was unguided by any specific hypothesis.

STATEMENT OF SUB-HYPOTHESIS (I)

The sub-Hypothesis was that for the teachers in the MAIN FAMILIAR SAMPLE, their attitudes to curriculum innovation (as measured by their scores for F'_A and F'_B, respectively) will correlate significantly with each of the independent variables (measured as described below).

However, to return to our main PROPOSITIONS (or general hypotheses), our interest in the present chapter was mainly in Dogmatism (as an antecedent PERSONALITY variable) and in the "KNOWLEDGE of curriculum innovation" variables (FAMILIARITY and ATTENDANCE on a COURSE). The correlations of Dogmatism with the teachers' attitudes were expected to be negative whilst the correlations for FAMILIARITY and for Attendance on a COURSE were expected to be positive (see chapter 2).

THE INDEPENDENT VARIABLES FOR THE MULTIPLE CORRELATION ANALYSES I AND II (AND THE PROCEDURES FOR SCORING THEM)

The criteria which were employed in selecting appropriate variables for correlation with the dependent variable in each of our multiple correlation analyses were the usual ones: each independent variable was expected to be highly related to the dependent variable, and the independent variables were expected to have relatively low interrelationships with each other. Moreover, it was assumed that the dependent variable had no effect on the independent variables.

Concerning the total number of independent variables to include in the explanatory framework we were drawn in~~t~~o two opposite directions. On the one hand, we were inclined to include a large number of them in order to explain as much of the variance in the dependent variable as possible, given that no computational effort was required in view of our easy access to computer facilities. Against this, however, was the practical question of the total length of the complete booklet of questionnaires that was to be presented to the teachers; already we had a questionnaire of 74 items about curriculum innovation and we had already decided to use the complete Dogmatism scale with its 40 items rather than the truncated 20-item scale (see below). The ideal was to obtain as high a squared multiple correlation as possible with a small set of independent variables. But this ideal was not easily attained.

In addition, if we were to avoid a raw kind of empiricism we had to be mindful of theoretical considerations in selecting our independent variables. Yet, given the altogether foreign situation in which we found ourselves to be researching in india, theoretical considerations alone could not suffice. Ultimately, our decision was based partly on our PRELIMINARY STUDIES (which included a review of the theoretical issues from the relevant literature) and partly on our consultation of Indian colleagues in the Education Research Unit at the TTTI, Madras. The variables which were finally selected were listed as follows:-

A. The SITUATIONAL variables

1. The BACKGROUND INFORMATION variables (e.g.,the "Teaching Experience of the teachers, their "Present Position" and the SIZE of the Polytechnics).

2. The KNOWLEDGE OF CURRICULUM INNOVATION variables (a) FAMILIARITY with the specific curriculum innovation in Engineering Drawing and (b) Attendance on a CRASH COURSE of training.

3. An ORGANIZATION variable (the teachers' Experience of Bureaucracy).

B. A PERSONALITY variable

Dogmatism.

A. The SITUATIONAL variables

The BACKGROUND INFORMATION Variables and the KNOWLEDGE of curriculum innovation variables

Five "BACKGROUND INFORMATION" variables were selected as shown in Figure 4.7.

The SIZE of a Polytechnic was identified as an important variable and a LARGE Polytechnic was said to be one with a student population greater than 400.

AGE was expected to be a correlate of the teachers' attitudes to curriculum innovation (Georgiades, 1967; Hull and others, 1973). However, AGE was not included in the list of BACKGROUND INFORMATION variables in India. We were given to understand that in the Indian

FIGURES 4.7

THE BACKGROUND INFORMATION AND KNOWLEDGE OF INNOVATION VARIABLES

Broad Category of variables	The designation of the variables	The Corresponding questionnaire items (Appendix E)
Background Information about the Polytechnics	Type of Polytechnic (Government/Private)	Q6.A
	Size of Polytechnic (Small/Large)	Q6.B
Background Information about the teachers	Present Position	Q6.1
	Number of years of Teaching Experience	Q6.2
	Professional Training (Trained/Untrained)	Q6.3
The Teachers' KNOWLEDGE of Curriculum Innovation	FAMILIARITY with the innovation in Engineering Drawing	Q6.4
	Attendance on a CRASH COURSE of training	Q6.5

context the mobility and promotion of teachers within the education system were centrally controlled; consequently such functional indicators of AGE as the "PRESENT POSITION" or Status of the teachers and their "TEACHING EXPERIENCE" were likely to be more informative than AGE (in the sense that they would explain more of the variation in the teachers' attitudes to curriculum innovation). There was some support for this argument from the literature (Gardner, 1964; Georgiades, 1967).

As for the KNOWLEDGE of Innovation variables, the complexities of the variations amongst the teachers in FAMILIARITY and in ATTENDANCE on a CRASH COURSE have been described already. However, the main point was that for the Multiple Correlation Analyses (I) and (II), the FAMILIARITY variable could only be categorised as "Very Familiar" or "Quite Familiar" because all the TAMIL NADU teachers had had experience in the use of the innovative, TTTI Curriculum materials.

The ORGANIZATION VARIABLE

In searching the literature for organization variables in educational settings we found that Owen (1970) had hinted at the possibility of one particular aspect of the social structural factors in an institution (the hierarchical structure) being related to attitudes to innovation. He thought that the stimulation of an organization which was "free from hierarchical rigidities" and in which there was "openness" was an important factor in facilitating the handling of innovation. Doll (1964) was more explicit; for him, the existence of rigid hierarchies and of standardised views of procedures and roles inhibited change. However, the credit for studying the organization climates of schools in a scientific way went to Halpin (1966). He distinguished between "open climates" and "closed climates". In a "closed climate" the principal set up rules and regulations about how things should be done, and these rules were usually arbitrary. By contrast, the principal in an "open climate" type of school was not aloof nor were the rules and procedures which he set up inflexible and impersonal. As for Technical Education, Tipton (1973) has observed that in England, bureaucratic methods of administration had been adopted over the years. According to Hicks (1974) what characterised technical institutions was not only an outdatedness in teaching methods but also a degree of rigidity in rules which was "characteristic more of the Poor Law" than of educational institutions.

With reference to the Polytechnics in India, we were given to understand that generally speaking, the Polytechnics in the state of TAMIL NADU were organized along formal lines and were bureaucratic in various degrees. According to Frankland (1971), a clear hierarchy of control had evolved within the system of Polytechnic education over such matters as "syllabus, evaluation and purchase of equipment". Moreover, the directive for the curriculum innovation in Engineering Drawing had emanated from the authority figure at the top, the Director of Technical Education, and had filtered down to the teachers through the Principals and Heads of Departments of the Polytechnics. Consequently, it was to be expected that the experience of bureaucracy within the "USER SYSTEM" would cause a certain amount of frustration and activate resistance to the innovation. Teachers who perceived their work situation as highly bureaucratic were likely to be less welcoming in their attitudes to the innovation than those who felt that they had some say in its implementation, let alone its initiation.

But the important question for us was to what extent differences in the teachers' subjective experience of bureaucracy explained the variation in their attitudes to the curriculum innovation. What was needed therefore was a measure of their experience of bureaucracy as they perceived it. An "Experience of Bureaucracy" scale which was developed at Bradford University and used to study the attitudes of engineering students to industrial training (Musgrove, 1968; 1970; Smithers, 1976) seemed appropriate for our purpose. The scale was derived from four organisational indices (see Appendix E) and was labelled Q11.

Only slight modifications in the wording were necessary; thus, for Item 13, the term "employees" was replaced by "Instructors/ Lecturers". The 14-item scale was of the 5-point Likert type. Items 1 to 5 and 13 to 14 were scored in the "reverse" direction whereas Items 6 to 12 were scored in the "normal" direction (the terms "reverse" and "normal" being used here as explained for the scoring of the attitude factors). The total score for each respondent was obtained by adding up all the item scores. The possible scores ranged therefore from a minimum of 14 at the "MILD" end of the scale to a maximum of 70 at the "SEVERE" end.

B. The PERSONALITY Variable (Dogmatism)

Rokeach's Dogmatism Scale E was used and was labelled Q12. It was a 40-item scale. We could have used the shorter, 20-item form developed by Troldahl and Powell (1965) and this would have been better for ease of test administration. However, the split-half reliability of the 20-item form was lower than that of the 40-item E scale according to the authors. More importantly, the shorter form violated the inner factorial structure of the E scale whereas one of the advantages of the latter scale was that it was possible with it to relate the teachers' attitudes to the different structural dimensions of Dogmatism.

The scoring procedures for Dogmatism were rather complicated. The 40-item Dogmatism Scale was a 6-point Likert type of scale (see

Appendix E). However, for scoring purposes this was converted to Rokeach's scale which ranged from -3 to +3 with the zero point excluded in order, as he himself said, to force responses towards agreement or disagreement. Still following Rokeach's procedure, a constant of 4 was added to each item score, thus transforming each scale to a 7-point scale. The direction of scoring was then reversed for all items so that high scores indicated a HIGH level of Dogmatism and low scores indicated a LOW level of Dogmatism. Finally, the total score for each respondent was obtained by summating his scores over all items. For the full Dogmatism scale then, the possible scores ranged from a minimum of 40 at the "OPEN-MINDED" end of the scale to a maximum of 280 at the CLOSE-MINDED (or DOGMATIC) end.

The MULTIPLE CORRELATIONS and higher-order SEMI-PARTIAL CORRELATIONS

The IBM (1969) (1130 Statistical System) computer program for Stepwise linear Regression Analysis was used to obtain multiple correlations and higher-order semi-partial correlations because these were amongst the output statistics for the program. Stepwise Regression Analysis was the technique by which variables for a regression equation were selected one at a time. As was customary in regression analysis, the dependent variables were called "criterion" variables and the independent variables, "predictor" variables. Now, in Stepwise regression analysis the most valid "predictor" variable (that is, the independent variable with the highest zero-order correlation), was selected first. Next, the independent variable which when combined with the first predictor variable added the most to the multiple correlation was selected. The reason for this was that the second predictor variable yielded the best regression equation with two predictor variables among the possible regression equations (with two predictor variables) which contained already the first selected predictor variable. Subsequent predictor variables were selected in a similar fashion. The basis of selection was the greatest improvement in the squared multiple correlation or to put it differently, in the "goodness of fit" of the regression equation.

At each step of the analysis an F test was made to determine whether the increment in the variance attributed to the predictor variable which was entered last was statistically significant. This variance was the difference in the squared multiple correlations before and after entering the particular predictor variable which was entered last. The value of F to enter a predictor variable (the "F to enter", as it was called) was given by the ratio of the variance attributed to the addition of the predictor variable entered last to the variance that remained unexplained, that is, the residual variance (Kerlinger, 1973). In the present study, an independent variable was only entered into the equation if the F ratio was significant at the 5 per cent level.

But the technique of Stepwise Regression Analysis allowed too for a further analysis to be made. At each step the contribution of each of the predictor variables which were already in the regression equation was re-examined. Such a re-examination was done by treating in turn each predictor variable as entering last in the regression equation. An F ratio was again calculated for each predictor variable in the equation when it entered last. If this ratio (now called an "F to remove") was not significant (again, at the 5 per cent level in the present study) the predictor variable was removed from the regression equation. The Stepwise

Regression Analysis was ended when no predictor variable in the regression equation had an "F to remove" which was not significant and no independent variable which was not in the equation had an "F to enter" which was significant.

From this explanation of Stepwise Regression Analysis and from our earlier presentation of Multiple Correlation Analysis in chapter 3, it followed that at each step in the regression analysis each predictor variable which was entered in the regression equation had its semi-partial correlation computed.

The first-order PARTIAL correlation analyses

In order to evaluate in a simple way the two causal models suggested in chapter 3 (Figure 3.4), for each of the second-level factors of attitude the procedure was to identify "U" variables which correlated with the factor (variable Y) as well as with Dogmatism (variable X). This procedure was then followed by a first-order Partial Correlation analysis. As Figure 4.8 shows, in this analysis each independent variable was partialled out in turn and the effect of doing so on the zero-order correlation of the other independent variable with the dependent variable was observed.

When calculating the zero-order correlations, attention had to be paid to the characteristics of the variables as we explain below.

The ZERO-ORDER Correlations

For the correlations of Dogmatism (Q12) and of Experience of Bureaucracy (Q11) with the attitude factors F'_A and F'_B, the Pearson product-moment correlation technique was used because these four variables were all continuous variables.

FIGURE 4.8

DIAGRAM ILLUSTRATING THE CALCULATIONS FOR THE FIRST-ORDER PARTIAL CORRELATIONS

Independent Variables	Zero-order correlation with second-level factor of attitude as dependent variable (Y)	Independent variables partialled out	
		X	U
X	r_{YX}	-	$r_{YX.U}$
U	r_{YU}	$r_{YU.X}$	-

(Note: X was Dogmatism and U was another correlate of Y)

Among the remaining independent variables some were genuine dichotomies others were not and had to be dichotomised. The former were: TYPE of Polytechnic (Government/Private), PROFESSIONAL TRAINING (Trained/Untrained), and Attendance on a CRASH COURSE (Yes/No). For each of these categorical variables, the respondents (the teachers) were given a score of 1 for the first alternative and 2 for the second alternative. According to Kendal (1967) when variables were truly dichotomous, we could simply calculate the product-moment correlations of these variables with continuous variables. Such a computation gave a correlation known as the point-biserial r_{pb} (Guilford, 1956). Consequently, the point-biserial (r_{pb}) was calculated for these three dichotomous variables.

The artificial dichotomies were TEACHING EXPERIENCE, PRESENT POSITION, SIZE of Polytechnic, and FAMILIARITY. The objective in dichotomising these variables was to enable us in the first place to calculate the point-biserial (r_{pb}) by again scoring the responses as 1 or 2 and computing the product-moment correlations with the "dependent" variables F'_A and F'_B respectively. However, in these circumstances, as Guilford (1956) has pointed out, the point-biserial (r_{pb}) was an underestimate of the amount of correlation. The point-biserial (r_{pb}) had therefore to be converted in the usual way to a biserial (r_b) which was a "good estimate" of Pearson r. Two points entered into our consideration here. Firstly, it was assumed that these variables were capable of representation by variates which were normally distributed. Secondly, the proportion of respondents scoring 1 or 2 had to be examined in order to make the necessary corrections. McKennell (1965) has reminded us, that this proportion could be so small as to produce a near zero correlation even where two variables were highly associated and Guilford (1956) has recommended that dichotomies should have the division point as near the median as possible.

Consequently, for the variable TEACHING EXPERIENCE, the dichotomisation was based on the response data. The response mode allowed for the responses to fall into three categories: less than five years, five to ten years and more than ten years. But the frequency distribution in the MAIN FAMILIAR SAMPLE (see Table 4.10, p.202) showed that only 15 per cent of the teachers had less than five years of teaching experience. The variable was therefore dichotomised as: "LESS THAN ten years" and "MORE THAN ten years". The variable "Present Position" or status also presented a problem for dichotomisation. The distribution in the MAIN FAMILIAR SAMPLE (see Table 4.10) was skewed towards the INSTRUCTORS. The variable was dichotomised as JUNIOR (position) and SENIOR (position). Junior Instructors and Demonstrators were placed in the first category, the other teachers in the second category. For the variable "Size of Polytechnic", as we have already indicated, a Polytechnic was SMALL or LARGE if the student population was less than or greater than 400. This categorisation was quite arbitrary. Lastly, for the variable FAMILIARITY, as we have already explained, within the MAIN FAMILIAR SAMPLE it was only possible to dichotomise the variable as "Quite FAMILIAR" and "Very FAMILIAR". For these four artificial dichotomies, the scoring was 1 for the first alternative and 2 for the second alternative.

Actually, the scoring procedures for FAMILIARITY forced us to examine closely the very basis of measurement for that variable. The FAMILIARITY categories were coded by the numerals 1 (for Very Unfamiliar), 2 (for Quite Unfamiliar), 3 (for Quite Familiar) and 4 (for Very Familiar) in our questionnaire (see Appendix E). However, the detailed description of category 1 was such that it was impossible to assume that this scale of number (1-4) had the property of equality of intervals over the whole scale. Consequently, the interpretation of these scale values and the numerical operations that were legitimate with them were limited. However, in practice, by suitably dichotomising the variable FAMILIARITY we were able to relate it to the dependent variables in our multiple correlation analyses.

4.3.5.2 THE PROCEDURES FOR THE MULTIPLE CORRELATION ANALYSIS (III)

As explained in chapter 2 (see Figure 2.7) we expected individual differences in teachers' attitudes to curriculum innovation <u>in general</u> to be related to their degrees of FAMILIARITY with a <u>specific</u> curriculum innovation. In order to explore this relationship in the present study we had to use as dependent variables in our Multiple Correlation Analysis III the measures of teachers' attitudes to curriculum innovation in general; these were the reliable first-level factors of attitude to curriculum innovation which were extracted from the one Section of our questionnaire which was about curriculum innovation in general. This was Section Q7 (Appendix E). It was also the only Section of the questionnaire that was given to the teachers in all the four states of SOUTH INDIA and consequently, the difference in degrees of FAMILIARITY was as wide as we could get. A point to make here was that the two second-level factors could not in any case be taken as dependent variables in this analysis because they were derived from other first-level factors as well and these had originated from Sections of the questionnaire which were not given to the NON-FAMILIAR teachers in the OTHER STATES.

However, before proceeding with the Multiple Correlation Analysis itself, we ascertained whether the factors that were extracted from the teachers' responses to Q7 in the MAJOR NON-FAMILIAR SAMPLE were "congruent" with the corresponding factors that were extracted from the MAIN FAMILIAR SAMPLE. It was reasonable to expect that the factor structure of the teachers' attitudes to curriculum innovation would be somewhat different as a result of FAMILIARITY with innovation. The greater understanding of innovation that came through the use of the innovative curriculum materials was bound to cause some disintegration in the core of the teachers' pre-innovation beliefs and attitudes. But if this disintegration occurred to such an extent that the very instruments used to measure the teachers' attitudes were completely distorted as a result of FAMILIARITY, then these instruments could not be validly used to measure both the pre-innovation and the post-innovation attitudes.

However, an objective measure of the similarity of factors obtained across various samples was Tucker's coefficient of congruence (see chapter 3), and consequently we tested the congruence of corresponding factors in the two samples. The results showed that only the factors which were obtained first in sequence of extraction were congruent (see Section 4.4.8 below). The argument then was that this congruence reflected a similarity in the pattern of beliefs in the two samples and therefore the same cluster of items could be used as an attitude measure in the two samples. As the first factor in the MAIN FAMILIAR SAMPLE was represented by the composite variable (f_1), this was the dependent variable used in the Multiple Correlation Analysis III.

The question which the Multiple Correlation Analysis III was intended to throw light on was the following:
How much of the variance in the teachers' attitudes to curriculum innovation <u>in general</u> as measured by (f_1) was explained by the variation in their degree of FAMILIARITY with the <u>specific</u> curriculum innovation in Engineering Drawing?
The Analysis was guided by the specific hypothesis stated below.

STATEMENT OF Sub-HYPOTHESIS (II)
For the teachers in the COMBINED GROUP (that is, those in the MAIN FAMILIAR SAMPLE and those in the MAJOR NON-FAMILIAR SAMPLE together), their attitudes to curriculum innovation <u>in general</u> (as measured by their (f_1) scores) will correlate positively and significantly with their degrees of FAMILIARITY (measured as

described below) with the specific curriculum innovation in Engineering Drawing.

The validity of the Multiple Correlation Analysis rested on the assumption that the MAJOR SAMPLE of NON-FAMILIAR teachers (in the OTHER STATES) and the MAIN SAMPLE of FAMILIAR teachers (in TAMIL NADU), were samples of the same population of Indian teachers of Engineering Drawing in South India. This was a reasonable assumption because they were all teachers of the same subject. In other words, it was a legitimate procedure to put these two samples of teachers together and consider the combined group of teachers formed in this manner as representing the population of Indian Engineering Drawing teachers in South India. It was then possible to dichotomise the FAMILIARITY variable and (for this particular analysis) to give to each individual teacher either a score of 1 for NON-FAMILIARITY or a score of 2 for FAMILIARITY.

The Independent Variables

The independent variables were the same as for the Multiple Correlation Analyses (I) and (II). The scoring procedures for the independent variables were also the same except for FAMILIARITY as we have explained.

4.4 THE RESULTS

The results in the present chapter are presented in the order shown below. For the sake of brevity and of clarity, details of these results are given in Appendices G to K. For the same reasons the Results of the teachers' "perceptions" of curriculum innovation (that is, their responses to our questionnaire about curriculum innovation at the item level) are given in Appendix G.

4.4.1 The SUMMARY of RESULTS for the first-level factors of attitude to curriculum innovation for the MAIN FAMILIAR SAMPLE.

4.4.2 The RESULTS of the item analyses for SECTIONS Q7, Q8, Q9, Q10 respectively

4.4.3 The RESULTS of the intercorrelations of the composite variables which represented the first-level factors of attitude to curriculum innovation.

4.4.4 The RESULTS of the second-level Factor Analysis of the intercorrelations of the composite variables.

4.4.5 The SUMMARY DATA for the "independent" variables in the Multiple Correlation Analyses (I) and (II).

4.4.6 The RESULTS of the CORRELATION ANALYSES in the MAIN FAMILIAR SAMPLE.

4.4.6.1 The RESULTS of the zero-order correlation analyses.

4.4.6.2 The RESULTS of the Multiple Correlation Analyses (I) and (II).

4.4.6.3 The RESULTS of the first-order Partial Correlation Analyses.

4.4.7 The SUMMARY DATA for the independent variables for the MAJOR NON-FAMILIAR SAMPLE.

4.4.8 The Results of the Factor Analysis of the teachers' responses to questionnaire Q7 (for the MAJOR NON-FAMILIAR SAMPLE).

4.4.9 The Results of Multiple Correlation Analysis III (in the COMBINED GROUP).

4.5 The ANALYSIS of RESULTS.

4.4.1 THE SUMMARY OF RESULTS FOR THE FIRST-LEVEL FACTORS OF ATTITUDE TO CURRICULUM INNOVATION FOR THE MAIN FAMILIAR SAMPLE.

The main features of the first-level factors of attitude to curriculum innovation are summarised in Table 4.3. Except for I:V(8C), the reliabilities of the attitude measures were above 0.5.

4.4.2 THE RESULTS OF THE ITEM ANALYSES FOR SECTIONS Q7, Q8, and Q10, RESPECTIVELY.

In this chapter we report only those results that were relevant to the subsequent analyses in the study and consequently the details of the results for Section Q9 and for factors I:V(8C), I:V(9A) and I:V(9B) are given separately in Appendix O.

4.4.2.1 THE RESULTS FOR SECTION Q7.

The product-moment, inter-item correlations for Q7 (Appendix H) were factoranalyzed. There were seven factors with latent roots greater than 1. An eigenvalue greater than 1 meant that in this case each factor explained more than 6 per cent of the variance in the teachers' responses since Q7 was made up of 17 items. Cattell's "scree test" (Appendix H) showed two points of inflexion and gave us the choice between a two-factor solution and a six-factor solution. Of these two solutions the latter was less attractive because of the fragmentation of the variance that it produced. Hence, two factors, explaining in total approximately 24.6 per cent of the variance in the teachers' responses were extracted and rotated.

TABLE 4.3

SUMMARY OF THE RESULTS FOR ALL THE FIRST-LEVEL FACTORS OF ATTITUDE TO CURRICULUM INNOVATION

Questionnaire Section	First-level factor	Composite Variable representing the factor	Descriptive statement for the factor	No. of Items	Reliability (Alpha co-efficient) of the factor
Q7	I:V(7A)	f_1	Belief that teachers should take the initiative in curriculum innovation	5	0.57
	I:V(7B)	f_2	Support for changes towards more relevant syllabuses	6	0.54
Q8	I:V(8A)	f_3	Belief that the NEW CURRICULUM materials facilitate the learning process (through their practical relevance and the individualisation of learning)	6	0.68
	I:V(8B)	f_4	Belief that the NEW CURRICULUM materials motivate students to learn	3	0.63
	I:V(8C)	-	———	4	0.49
Q9	I:V(9A)	f_5	Belief in the innovativeness of the teachers' support materials	4	0.79
	I:V(9B)	f_6	Belief in the innovativeness of the students' support materials	3	0.74
Q10	I:V(10A)	f_7	Support for the conditions that facilitate the adoption of the NEW CURRICULUM	11	0.75
	I:V(10B)	f_8	Opposition to NEW CURRICULUM materials that are highly specific, syllabus-bound and inaccessible	9	0.73
	I:V(10C)	f_9	Belief in the teachers' need for confidence in teaching the NEW CURRICULUM	3	0.53

Note: I:V(8C) was discarded because of its low reliability.

Table 4.4 gives the result of the Varimax Rotation. Items 9, 10, 11, 16, 17 had high factor loadings (> 0.4) on Factor I and were selected to represent it. For the same reason, items 3, 4, 5, 6, 12, 14 were selected to represent Factor II. A clear identification of these two factors was not difficult although Eysenck (1947, b) has rightly warned against labelling too hastily a factor which others might interpret in a rather different way, or which they might even regard as a "curious collection of heterogeneous entities". However, the salient items were listed in descending order of their loadings on their respective factors (Figure 4.9) and the factors were interpreted in terms of these defining items. Thus, Factor I was interpreted as a factor of "Belief that teachers should take the initiative in curriculum innovation" and Factor II as a factor of "Support for changes towards more relevant syllabuses". These two first-level factors were "Intervening Variables" and were therefore designated as I:V(7A) and I:V(7B) respectively.

The two composite variables representing I:V(7A) and I:V(7B) were designated as (f_1) and (f_2) respectively. The factor scoring for (f_1) and (f_2) was by the "incomplete method".

The average inter-item correlations ($\bar{r}$) for (f_1) and for (f_2) were (.207) and (.166) respectively, and the alpha coefficients were (.57) and (.54). (See Appendix H).

Appendix I shows that the frequency distributions for both composite variables came close to normality and covered almost completely the whole range of possible scale values.

TABLE 4.4

VARIMAX ANALYSIS OF THE ITEMS OF SECTION Q7 FOR THE MAIN FAMILIAR SAMPLE (n = 80)

Item Number	Rotated factor loadings I	Rotated factor loadings II	Communality (h^2) %
1	.239	-.041	5.9
2	.108	-.386	16.1
3	.247	.577	39.4
4	-.192	.463	25.1
5	.155	.575	35.5
6	.073	.519	27.5
7	.244	.277	13.6
8	.304	.079	9.9
9	.592	-.263	41.9
10	-.542	.145	31.5
11	.451	.104	21.4
12	-.238	.412	22.7
13	.082	.359	12.9
14	-.095	.522	27.3
15	.190	.011	3.6
16	.699	.159	51.4
17	.555	-.016	30.8
Percentage Variance	12.357	12.228	

Note: (a) See Appendix H for the inter-item correlation matrix and for the unrotated factor loadings.

(b) Factor I was designated as I:V(7A) in the text and Factor II as I:V(7B).

FIGURE 4.9

THE DEFINING ITEMS FOR THE FIRST-LEVEL FACTORS OF ATTITUDE TO CURRICULUM INNOVATION I:V(7A) and I:V(7B) RESPECTIVELY

A. The defining items for I:V(7A) (Belief that teachers should take the initiative in curriculum innovation)

Item Number in Section Q7	Statement	Factor Loading	Direction of Scoring
16	It is a waste of time for the instructor/lecturer to try new ideas unless the head of department approves of them	.699	normal
9	Instructors/lecturers have so much work that they have no time for curriculum innovation	.592	normal
17	There is no incentive for the instructor/lecturer to initiate curriculum innovation	.555	normal
10	Curriculum innovation should be the responsibility of Polytechnic instructors/ lecturers	-.542	reverse
11	It is for teacher-trainers (lecturers at the TTTI's) to find out what is wrong with the curriculum of Polytech-nic courses (in engineering)	.451	normal

Note: (a) These items made up the composite variable (f_1).

(b) For the direction of scoring, see Section 4.2.5.

B. <u>The defining items for I:V(7B) (Support for change towards more relevant syllabuses)</u>

Item Number in Section Q7	Statement	Factor Loading	Direction of Scoring
3	I wish students did not have to study such a lot of irrelevant subject matter	.577	reverse
5	It is because of the syllabus that teaching is of low standard	.575	reverse
14	Practising engineers should be involved in planning new engineering courses	.522	reverse
6	Without autonomy in Polytechnics there can be no curriculum innovation	.519	reverse
4	Only curriculum innovation will reduce the number of students who fail their courses	.463	reverse
12	Practising instructors/lecturers should definitely be involved when new curriculum (course) materials are being written and tried out	.412	reverse

Note: (a) These items made up the composite variable (f_2).

(b) For the direction of scoring, see Section 4.2.5.

4.4.2.2 THE RESULTS FOR SECTION Q8.

The results of the inter-item correlation analysis and of the Principal Components analysis (Appendix H) pointed to a seven-factor solution if we were to adopt Kaiser's criterion. Cattell's "scree test" was not helpful in arriving at a decision on the number of factors to be extracted because there was no definite point of inflexion in the graph (Appendix H). However, the percentage of variance explained by each successive factor after the first three was relatively small. Hence we decided to extract three factors since the first three factors carried each a substantial portion of the variance and were the only ones likely to enable us to obtain sets of items that were internally consistent. The total amount of variance explained by these three factors was 38.5 per cent.

The salient items (loadings greater than 0.4) for Factor I were easily identified as items 1, 3, 4, 5, 9, 10, (Table 4.5). Following the procedure described for Section Q7, these items were arranged in descending order of their factor loadings (Figure 4.10) and labelled I:V(8A). The factor was interpreted as a factor of "Belief that the NEW CURRICULUM materials facilitated the learning process (through their practical relevance and the individualisation of learning)". The composite variable which represented this factor was labelled (f_3).

For Factor II, items 7, 16 and 17 were the salient items. Items 13 and 14 also had loadings greater than 0.4 (.445 and .408 respectively). However, item 13 had an even higher loading (.567) on Factor III. As for item 14 when it was brought in with the cluster of three items which defined Factor II, it reduced the

TABLE 4.5

VARIMAX ANALYSIS OF THE ITEMS OF SECTION Q8 FOR THE MAIN FAMILIAR SAMPLE (n = 80)

Item number	Rotated factor loadings			Communality h^2 %
	I	II	III	
1	.535	-.182	.356	44.6
2	.177	-.224	.472	30.4
3	.551	-.366	.183	47.1
4	.729	-.063	-.157	56.0
5	.612	-.095	-.228	43.6
6	.326	.016	-.247	16.8
7	.071	.649	.263	49.6
8	.252	-.113	.458	28.6
9	.626	-.372	-.049	53.3
10	.441	.031	.010	19.6
11	-.001	.000	.182	3.3
12	.133	.350	-.348	26.1
13	.149	.445	-.567	54.2
14	-.260	.408	-.214	28.0
15	.309	.316	-.470	41.7
16	.113	.711	.316	61.8
17	.122	.603	.359	50.7
Percentage Variance	14.8	13.3	10.4	--

Note: (a) See Appendix H for the inter-item correlation matrix and for the unrotated factor loadings.

(b) Factor I was designated as I:V(8A) in the text and Factors II and III as I:V(8B) and I:V(8C) respectively; however, I:V(8C) did not figure in subsequent analyses because the composite variable which would have represented it had a low reliability.

(c) The raw data for this analysis was the teachers' responses about the TTTI materials; the teachers' responses about "other existing" materials were analysed in Chapter 5 (see also Section Q8 in Appendix E).

FIGURE 4.10

THE DEFINING ITEMS FOR THE FIRST-LEVEL FACTORS OF ATTITUDE TO CURRICULUM INNOVATION I:V(8A) AND I:V(8B) RESPECTIVELY

A. The defining items for I:V(8A)

Item Number in Section Q8	Statement	Factor Loading	Direction of Scoring
4	The course materials are written in such a way that they allow the teacher plenty of time for individual help for students	0.729	reverse
9	For each topic a number of practice exercises are given in which students complete exercises and drawings	0.626	reverse
5	The course materials provide students with so much information that the teacher does not have to do much lecturing	0.612	reverse
3	The course materials enable students to develop practical drafting skills	0.551	reverse
1	There is an attempt to relate the topics covered in the course materials closely to industrial drawings	0.535	reverse
10	The exercises are arranged in such a way that students do the easy ones first before going to the difficult exercises	0.441	reverse

B. The defining items for I:V(8B)

16	The course materials used do not motivate students to study on their own because the language used is too difficult	0.711	normal
7	The course materials contain too many details and students get rather confused	0.649	normal
17	The course materials used arouse no interest in the students	0.603	normal

average inter-item correlation ($\bar{r}$) for the cluster from (0.359) to (0.231) and the corresponding reliability (alpha coefficient) from .63 to .54. Factor II was therefore defined by three salient items only. It was designated as I:V(8B). The composite variable which was constructed from these three items to represent the factor was labelled (f_4). Inspection of the three items produced an interpretation of Factor II as one of "Belief that the NEW CURRICULUM materials motivated students to learn".

Factor III was labelled I:V(8C). It had high loadings (greater than 0.4) on items 2, 8, 13, and 15. However, the alpha coefficient (see Appendix O) for that set of items was only 0.49. This coefficient was admittedly only slightly less than the minimum reliability of 0.5 which we were prepared to accept. But apart from the question of reliability, items 2 and 8 had low communalities and the factor was not easily interpreted by inspecting its defining items. As already indicated, we decided to discard Factor III from our subsequent analyses.

The average inter-item correlations ($\bar{r}$) for the variables (f_3) and (f_4) were (.259) and (.359), respectively. The corresponding alpha coefficients were (.68) and (.63) (Appendix H). The frequency distributions for both composite variables were skewed negatively (Appendix I).

4.4.2.3 THE RESULTS FOR SECTION Q10

The Principal Components Analysis (Appendix H) yielded nine factors with latent roots greater than 1. Each of these factors therefore explained more than 3% of the variance. However, on the basis of the "scree test" and of the difference in the percentage of variance explained by successive factors, only the first three factors were rotated. The results of this three-factor solution were as shown in Table 4.6. Factor I was characterised by eleven items with loadings just short of and above 0.4. It had to do with a number of conditions that seemed to determine the successful implementation of the curriculum innovation in Engineering Drawing. The more prominent amongst these conditions were the difficulties experienced in implementing the NEW CURRICULUM in practice: these were class size (Item 7) and preparation time for making the necessary teaching aids (Item 9). Among the other conditions which were related to the adoption of rejection of the innovation, there were, for example, the balance in skills content in the NEW CURRICULUM (Item 13) and the incorporation of test papers into the students' support materials (Item 21). Factor I was interpreted as one of "Support for the conditions that facilitate the adoption of the NEW CURRICULUM". It explained 12.8 per cent of the common variance. Following previous practice in nomenclature, Factor I was designated as I:V(10A) and the set of items which defined it was labelled (f_7) (Figure 4.11).

For Factor II, there were eleven items with loadings just short of or above 0.4. However, two of these items (Items 2 and 3) had higher loadings on Factor III and the interpretation of Factor II was facilitated by excluding these two items from the cluster that defined it (Factor II). The factor seemed to be concerned with the narrowness (or breadth) of perspective which teachers had of the TTTI materials. There was, for example, the question of the extent to which the TTTI innovative materials were highly specific (Items 6, 12, 17), syllabus-bound (Item 22), accessible (Item 8),

TABLE 4.6

VARIMAX ANALYSIS OF THE ITEMS OF SECTION Q10 FOR THE MAIN FAMILIAR SAMPLE (n = 80)

Item Number	Rotated factor loadings I	II	III	Communality (h^2) %
1	.363	-.118	.077	15.2
2	.147	.432	.512	47.0
3	.367	-.414	.506	56.2
4	-.019	.289	.277	16.1
5	.181	-.316	.136	15.1
6	.237	-.565	.301	46.6
7	-.567	-.139	.493	58.4
8	-.257	.541	-.142	37.8
9	-.644	-.091	.334	53.5
10	-.103	-.075	.524	29.0
11	-.020	.569	-.059	32.7
12	-.368	.455	.260	41.0
13	.552	-.184	.472	56.1
14	.535	-.149	.316	40.9
15	.235	-.083	.392	21.6
16	-.110	.473	.265	30.6
17	.039	-.515	.257	33.3
18	-.464	-.114	.183	26.1
19	-.319	.284	.159	20.7
20	-.193	.398	.172	22.5
21	-.590	.076	.202	39.4
22	-.147	.618	.233	45.8
23	.065	-.031	.442	20.1
24	.451	-.056	.257	27.3
25	.394	.238	.319	31.4
26	.546	-.270	.010	37.2
27	.512	-.062	.021	26.6
28	-.315	.089	.348	22.9
29	-.008	.358	-.052	13.1
30	.003	-.005	.242	5.8
31	-.374	.396	-.094	30.5
32	.460	-.124	.294	31.2
Percentage Variance	12.8	10.5	9.0	

FIGURE 4.11

THE DEFINING ITEMS FOR THE FIRST-LEVEL FACTORS OF ATTITUDE TO CURRICULUM INNOVATION I:V(10A), I:V(10B), I:V(10C) RESPECTIVELY

A. The defining items for I:V(10A) (Support for the conditions that facilitate the adoption of the NEW CURRICULUM)

Item Number in Section Q10	Statement	Factor Loading	Direction of Scoring
9	I should be given more preparation time at work in order to make the teaching aids necessary to use the TTTI materials properly	-0.644	normal
21	The test papers should be attached to the teachers' support materials and not to the students' support materials	-0.590	normal
7	Classes in the Polytechnics are too big to implement the TTTI curriculum innovation	-0.567	normal
13	The TTTI materials seem to be designed to develop the right balance in the skills of reading and preparing actual drawings	0.552	reverse
26	Students using the TTTI materials do not think of their course in terms of examination success only	0.546	reverse
14	The TTTI materials help students to become skilful in the use of engineering drawing instruments	0.535	reverse
27	I feel that I have been given all the facilities to use the TTTI materials	0.512	reverse
18	The TTTI materials should not be biased towards mechanical engineering	-0.646	normal
32	The only reason why the TTTI materials have prestige value is that these materials are of good quality	0.460	reverse
24	Students feel that the TTTI materials are so well prepared that they can readily get on with the work in class	0.451	reverse
25	Students welcome exercises of the completion type	0.394	reverse

B. <u>The defining items for I:V(10B) (Opposition to NEW CURRICULUM materials that are highly specific, syllabus-bound and in-accessible)</u>

Item Number in Section Q10	Statement	Factor Loading	Direction of Scoring
22	The test questions for some of the topics studied in the TTTI materials require additional information often not directly related to the topics	0.618	normal
11	When I meet with difficulties in using the TTTI materials I tend to think that it is the fault of the materials rather than my own fault	0.569	normal
6	I feel that the teaching techniques recommended in the TTTI materials should also be applied to the teaching of other subjects in the engineering course	-0.565	reverse
8	The TTTI materials are too costly in their present form for Polytechnic students	0.541	normal
17	Students should derive the greatest benefit if materials similar to the TTTI materials are prepared for the whole of the three years of the course (in engineering drawing)	-0.515	reverse
16	The TTTI materials should give practice in the basic skills of engineering drawing through many more exercises	0.473	normal
12	It's wrong for the TTI materials to put the same degree of emphasis on drafting skills for all technician students	0.455	normal
20	Some of the topics dealt with in the TTTI materials are made difficult merely for the sake of using different teaching techniques	0.398	normal
31	The innovators do not seem concerned with day-to-day problems of classroom teaching	0.396	normal

C. THE DEFINING ITEMS FOR I:V(10C) (BELIEF IN THE TEACHERS' NEED FOR CONFIDENCE IN TEACHING THE NEW CURRICULUM)

Item Number in Section Q10	Statement	Factor Loading	Direction of Scoring
10	I should have plenty of guidance from TTTI in the preparation of teaching aids to implement the materials.	0.524	normal
2	The trouble with having all these TTTI materials is that I feel that I cannot add any information of my own or give exercises of my own.	0.512	normal
3	The TTTI materials give me confidence in my teaching.	0.506	normal

and convergent on day-to-day problems of classroom teaching (Item 31). The factor was designated as I:V(10B) and interpreted as a factor of "Opposition to NEW CURRICULUM materials that are highly specific, syllabus-bound and inaccessible". The composite variable which was constructed from the salient items was designated as (f_8) (Figure 4.11). I:V(10B) explained 10.5 per cent of the common variance.

Factor III presented us with several difficulties. There were seven items with loadings just short of or above 0.4. However, of these seven items, two (Items 7 and 13) were already enlisted as the defining items for Factor I. Another two (Items 15 and 23) had low communalities. Moreover, if these items were retained as defining items for Factor III, the reliability (alpha coefficient) of the cluster would then be lowered from (0.53) to (0.48), that is, it would fall below our imposed limit of 0.5 for reliability. Factor III was therefore defined by the three remaining items (items 2, 3, 10). These centred around the teachers' beliefs in their need for confidence in teaching the new materials. It was not obvious why Item 2 belonged to this cluster of items unless it was interpreted as meaning that the trouble with the TTTI materials was that they tended to destroy the teacher's confidence in his ability to supplement the new materials by additional information of his own and by his own exercises. Because of this interpretation, Item 2 was scored in the "normal" direction, that is, disagreement with the statement (as for disagreement with the statements in Items 3 and 10) implied the wish to retain one's independence from the innovators' materials and the assertion of one's own professional competence. It was recognised that Item 2 was probably badly worded and its meaning unclear. Nevertheless, it was retained along with the other two items to form the composite variable (f_9). This composite variable represented Factor III which was designated as I:V(10C).

The average inter-item correlations ($\bar{r}$) for (f_7), (f_8) and (f_9) were (0.218, 0.233 and 0.272), respectively (Appendix H). The corresponding alpha coefficients were (0.75), (0.73) and (0.53).

The frequency distributions for the three composite variables (f_7), (f_8) and (f_9) respectively, came close to being symmetrical (Appendix I).

4.4.3 THE RESULTS OF THE INTERCORRELATIONS OF THE COMPOSITE VARIABLES WHICH REPRESENTED THE FIRST-LEVEL FACTORS IN THE MAIN FAMILIAR SAMPLE (n = 80).

Table 4.7 showed at a glance a distinct clustering of the correlations for three of the composite variables; these were f_4, f_7, and f_8.

TABLE 4.7

MATRIX OF THE PRODUCT-MOMENT INTER-CORRELATIONS OF THE COMPOSITE VARIABLES WHICH REPRESENTED THE FIRST-LEVEL FACTORS OF ATTITUDES TO CURRICULUM INNOVATION IN THE MAIN FAMILIAR SAMPLE (n = 80)

	The composite variables which represented the first-level factors						
	f_1 I:V(7A)	f_2 I:V(7B)	f_3 I:V(8A)	f_4 I:V(8B)	f_7 I:V(10A)	f_8 I:V(10B)	f_9 I:V(10C)
f_1	-						
f_2	.010	-					
f_3	-.029	-.117	-				
f_4	.008	-.280*	.108	-			
f_7	.146	.001	.168	.262*	-		
f_8	.064	-.157	.235*	.482**	.439**	-	
f_9	-.197	-.055	.134	-.029	.184	.077	-

* Significant at the five per cent level
($P_{.05}$ = .217, for df = 80)

** Significant at the one per cent level
($P_{.01}$ = .283, for df = 80)

Note: The factor scores for the composite variables are given in Appendix I.

The correlation ($r = .439$, $P<\cdot01$) between f_7 and f_8 was remarkably high given that the two first-level factors which these variables represented were orthogonal to each other; but this was the expected consequence of factor representation by marker variables only.

The significant negative correlation ($r = -.280$ $P<\cdot05$) between (f_2) and (f_4) was hardly surprising because teachers who believed that the NEW CURRICULUM materials motivated their students to learn (f_4) were likely to oppose the idea of changes towards more relevant syllabuses as implied in (f_2).

4.4.4 THE RESULTS OF THE SECOND-LEVEL FACTOR ANALYSIS (OF THE INTERCORRELATIONS OF THE COMPOSITE VARIABLES) IN THE MAIN FAMILIAR SAMPLE ($n = 80$)

The Principal Components Analysis of the product-moment intercorrelations of the composite variables which represented the first-level factors of attitude to curriculum innovation yielded three factors with latent roots greater than 1, one of which was just above 1 (1.09) (Table 4.8). However, the Scree test seemed to indicate a TWO-FACTOR solution (Appendix J). Observation of the unrotated factor loadings (Table 4.8) also favoured a TWO-FACTOR solution. The loadings showed that Factor I was characterised by the cluster of composite variables (f_4), (f_7) and (f_8) as was evident from the correlation matrix. They showed too that Factor II was characterised quite distinctly by the doublet (f_1) and (f_9) although such a clustering was not obvious in the correlation matrix. But about Factor III there was some uncertainty because f_2 and f_7 were common to both Factor I and Factor III. Rotation of the factors was therefore expected to

TABLE 4.8

SECOND-LEVEL FACTOR MATRIX FOR THE COMPOSITE VARIABLES WHICH REPRESENTED THE FIRST-LEVEL FACTORS OF ATTITUDE TO CURRICULUM INNOVATION (FROM THE INTER-CORRELATIONS IN THE MAIN FAMILIAR SAMPLE (n = 80))

The composite variables representing the first-level factors	COMMON FACTOR LOADINGS (Unrotated)			h^2 (%)
	I	II	III	
f_1	-.093	.734	.289	63.1
f_2	.385	.068	.723	67.5
f_3	-.446	-.306	.094	30.2
f_4	-.708	.185	-.352	65.9
f_7	-.665	.065	.517	71.3
f_8	-.813	.107	.064	67.6
f_9	-.224	-.740	.282	67.8
Latent Roots	2.011	1.236	1.090	
% Common Variance	28.7	17.7	15.57	

TABLE 4.9

VARIMAX ANALYSIS OF THE COMPOSITE VARIABLES WHICH CHARACTERISED THE FIRST-LEVEL FACTORS OF ATTITUDE TO CURRICULUM INNOVATION IN THE MAIN FAMILIAR SAMPLE (n = 80)

A. The TWO-FACTOR Solution

The Composite Variables	Rotated Second-Level factor loadings I	II	Communality (h^2) %
f_1	-.169	.721	54.8
f_2	.375	.108	15.2
f_3	-.412	-.351	29.3
f_4	-.724	.109	53.6
f_7	-.668	-.005	44.6
f_8	-.820	.021	67.3
f_9	-.146	-.759	59.7
Percentage Variance	28.6	17.7	

(Note: Factor I was designated as F_A and Factor II as F_B.)

B. The THREE-FACTOR Solution

The Composite Variables	Rotated Second-Level factor loadings			Communality (h^2) %
f_1	-.299	.718	.162	63.1
f_2	-.054	.105	.813	67.5
f_3	-.398	-.354	-.134	30.2
f_4	-.437	.108	-.676	65.9
f_7	-.839	-.011	.096	71.3
f_8	-.734	.017	-.370	67.6
f_9	-.265	-.762	.164	67.8
Percentage Variance	25.06	17.8	19.07	

clarify the composition of Factor III and at the same time help to determine the locations of the remaining composite variables (f_2) and (f_3). We decided to examine both a TWO-FACTOR solution and a THREE-FACTOR solution. Table 4.9 shows that the THREE-FACTOR solution left (f_3) with medium size loadings still on Factor I and Factor II but pointed to (f_2) as being definitely a marker variable for Factor III. However, the THREE-FACTOR solution also split the cluster of three variables (f_4, f_7, f_8) whereas the TWO-FACTOR solution left it intact. Because of the splitting of this cluster and because of doubt surrounding the composition of Factor III in the THREE-FACTOR solution, the choice between a TWO-FACTOR solution and a THREE-FACTOR solution was a difficult one to make. In the end, the principle of parsimony prevailed and the TWO-FACTOR solution was preferred. Factor I was designated as F_A and the cluster of composite variables which characterized it was labelled F'_A. Building on the earlier interpretations given to its three marker variables (f_4, f_7, f_8), the factor was identified as one of "Support for the design, content and teaching requirements of the NEW CURRICULUM". Factor II was designated as (F_B) and the cluster of marker variables which characterized it as F'_B. Interpretation of factor F_B was straightforward enough when such interpretation was based on salient variables; it was a factor of "Belief in the professional competence of teachers for initiating and implementing curriculum innovation".

The specification equations that were used for estimating the factor scores by the "incomplete method" were those given in Figure 4.12. The weightings shown for the marker variables were the factor loadings already given in Table 4.9 (A) but correct

FIGURE 4.12

THE SPECIFICATION EQUATIONS USED FOR ESTIMATING THE FACTOR SCORES FOR THE SECOND-LEVEL FACTORS OF ATTITUDE TO CURRICULUM INNOVATION BY THE "INCOMPLETE METHOD"

Factor Scores for F'_A	F'_A score =-.7238(f_4 score)-.6678($f_7$score)-.8198(f_8 score)
Factor Scores for F'_B	F'_B score = .7208 (f_1 score) -.7597 (f_9 score)

Note: the scores for the composite variables which represented the first-level factors were standardised scores.

to four decimal places. The actual steps in the calculation of the factor scores were straightforward. Taking F'_A first, to obtain an individual's factor score his score for each of the constituent marker variables (f_4, f_7, f_8) was first standardised and then multiplied by the appropriate weighting. These weighted standardised scores for each of the marker variables were then summated and the total was listed as the factor scores. However, in subsequent analyses involving these factor scores, the algebraic sign for these factor scores had to be reversed. This was done because the factor loadings for all the three marker variables were negative, that is, the three marker variables correlated negatively with the factor. The same procedures were used for calculating the F'_B scores except that the algebraic sign for the factor scores was not reversed.

When scoring F_A and F_B by the "complete method" the regression coefficients for weighting the scores of the composite variables and the factor scores for F_A and F_B themselves were all readily obtained as an option in the IBM programme output for the factor analysis. The product-moment correlations of these factor scores with the corresponding factor scores obtained by the "incomplete method" (that is, the scores for F'_A and F'_B), were 0.975 and 0.98 respectively. This was an important result in view of the intended replication of the study by using only the marker variables that is, by using F'_A and F'_B. Moreover, the product-moment correlation ($r = 0.006$) between the two clusters of marker variables themselves (that is, between F'_A and F'_B) showed that in the present case the orthogonal factor structure was largely maintained when representing the factors by marker variables. Thus, the two sets of composite marker variables were quite independent, the correlation between them being the arbiter of independence.

Turning to the descriptive statistics for F'_A and F'_B the mean scores for both were zero as the scores for the marker variables were all standardised. The standard deviations were 1.717 and 1.146 respectively. The frequency distribution of the factor scores for the composite variable F'_B was very close to normality (see Appendix J). By contrast, the frequency distribution of the factor scores for F'_A lacked symmetry. There was an overall negative skewness and the outstanding feature of the distribution was the one very extreme negative score. An interesting point to note was that this extreme scorer was also the most Dogmatic person in the group (Appendix J). However, in spite of the skewness, we proceeded with the planned correlation analyses because of the assumption that the distribution for the underlying dimension was normal.

4.4.5 THE SUMMARY DATA FOR THE INDEPENDENT VARIABLES IN THE MULTIPLE CORRELATION ANALYSES (I) AND (II)

As Table 4.10 shows, all the teachers in the MAIN FAMILIAR SAMPLE were either "VERY FAMILIAR" or "QUITE FAMILIAR" with the curriculum innovation in Engineering Drawing. A substantial majority among them (70 per cent) were Instructors with LESS THAN 10 years of TEACHING EXPERIENCE. Moreover, 84 per cent had no PROFESSIONAL TRAINING, 70 per cent had not attended a CRASH COURSE of training for implementing the innovation, 54 per cent worked in LARGE Polytechnics and 60 per cent taught in PRIVATE Polytechnics. The distributions of scores for Experience of Bureaucracy (Q11) and for Dogmatism (Q12) respectively, were close to normality (Appendix J).

However, the important point to note about the Dogmatism scores (Table 4.11) was that the overall level of Dogmatism in the sample was astonishingly high; the reported level of Dogmatism in a number of studies in different countries (e.g., those of Rokeach (1960), Voth (1965), Drakeford (1969), Smithers (1970), McLeish and Park (1973), Lobley (1974) and Willis (1977)), showed that the mean scores were usually in the range of 125 to 170 approximately.

4.4.6 THE RESULTS OF THE CORRELATION ANALYSES IN THE MAIN FAMILIAR SAMPLE.

4.4.6.1 THE RESULTS OF THE ZERO-ORDER CORRELATION ANALYSES

Dogmatism was the one independent variable that correlated significantly

TABLE 4.10

THE SUMMARY DATA FOR THE INDEPENDENT VARIABLES FOR THE MAIN FAMILIAR SAMPLE (n = 80): RESPONSE FREQUENCIES FOR THE BACKGROUND INFORMATION VARIABLES AND THE KNOWLEDGE OF CURRICULUM INNOVATION VARIABLES

Question Number (Questionnaire Q6)	Background Information and Knowledge Variables	Categories of Responses	Response Frequencies (%)
Q6.A	Type of Polytechnic	Government	40 (32)
		Private	60 (48)
Q6.B	Size of Polytechnic	Small	46.25 (37)
		Large	53.75 (43)
Q6.1	Present Position	Demonstrator	8.75 (7)
		Junior Instructor	35 (28)
		Senior Instructor	32.5 (26)
		Workshop Superintendent	- (0)
		Associate Lecturer	12.5 (10)
		Lecturer	5 (4)
		Lecturer in Charge	- (0)
		Head of Department	3.75 (3)
		Other Senior Staff	2.5 (2)
Q6.2	Teaching Experience	Less than five years	15 (12)
		Five to ten years	55 (44)
		More than ten years	30 (24)
Q6.3	Professional Training	Trained	16.25 (13)
		Untrained	83.75 (67)
Q6.4	FAMILIARITY	Very Unfamiliar	- (0)
		Quite Unfamiliar	- (0)
		Quite Familiar	53.75 (43)
		Very Familiar	46.25 (37)
Q6.5	Attendance on a CRASH COURSE	Yes	30 (24)
		No	70 (56)

(Note: The actual response frequencies are in brackets).

TABLE 4.11

MEANS AND STANDARD DEVIATIONS OF SCORES FOR DOGMATISM AND FOR EXPERIENCE OF BUREAUCRACY IN THE MAIN FAMILIAR SAMPLE (n = 80)

Variables			
Dogmatism		Experience of Bureaucracy	
M	S.D.	M	S.D.
194.6	25.504	43.05	7.86

Note:

a. Minimum possible score for Dogmatism = 40
Maximum possible score for Dogmatism = 280

b. Minimum possible score for Experience of Bureaucracy = 14
Maximum possible score for Experience of Bureaucracy = 70

with both second-level factors of attitude to curriculum innovation (Table 4.12). Indeed, the correlations were significant at the one per cent level (r = -.311 and -.421 respectively) and they were in the expected directions. They indicated that the more Dogmatic amongst the teachers tended not to lend support to the design and content of the new curriculum (F'_A) and not to believe in the professional competence of teachers for initiating and implementing curriculum innovation (F'_B).

But observation of the correlations in Table 4.12 also showed that whilst no other independent variable correlated with F'_B, two other independent variables (PRESENT POSITION and Attendance on a CRASH COURSE) had substantial, negative, and significant correlations with F'_A (r = -.244 and -.253, respectively, $P<.05$). Thus, it seemed that the SENIOR teachers in the Polytechnics as well as those who had not Attended a CRASH COURSE tended to resist

TABLE 4.12

THE ZERO-ORDER CORRELATIONS IN THE MAIN FAMILIAR SAMPLE (n = 80) FOR EACH OF THE SECOND-LEVEL FACTORS OF ATTITUDE (TO CURRICULUM INNOVATION) WITH THE "INDEPENDENT" VARIABLES

"Independent" Variables		The Zero-Order Correlations For F'_A	The Zero-Order Correlations For F'_B
BACKGROUND INFORMATION VARIABLES	Type of Polytechnic (Q6.A) (Government/ Private)	.133	.020
	Size of Polytechnic (Q6.B) (Small/Large)	.083	.050
	Present Position (Q6.1) (Junior/Senior)	-.244*	-.011
	Teaching Experience (Q6.2) (LESS THAN/ MORE THAN 10 years)	-.038	-.165
	Professional Training (Q6.3) (Trained/ Untrained)	-.032	.009
KNOWLEDGE of Curriculum Innovation Variables	FAMILIARITY (Q6.4) (Quite Familiar/Very Familiar)	-.009	.001
	Attendance on a CRASH COURSE (Q6.5) (Yes/No)	-.253*	.080
Organization Variable	Experience of Bureaucracy (Q.11)	-.138	-.190
Personality Variable	Dogmatism (Q.12)	-.311**	-.421**

* Significant at the five per cent level ($P_{.05}$ = .217, for df = 80)

** Significant at the one per cent level ($P_{.01}$ = .283, for df = 80)

Note: (a) For the categorical variables, the scoring was 1 for the first alternative and 2 for the second alternative.

(b) The correlations given here for the artificial dichotomies (SIZE of Polytechnic, TEACHING EXPERIENCE, PRESENT POSITION and FAMILIARITY) were obtained after correction (see Appendix J).

the design and content of the innovation in Engineering Drawing.

FAMILIARITY did not correlate with the teachers' attitudes to curriculum innovation.

4.4.6.2 THE RESULTS OF THE MULTIPLE CORRELATION ANALYSES (I) AND (II)

In Appendix J we reproduce the summary of the computer printout for the Stepwise Regression Analyses. The regression analysis for F_A' was stopped after STEP 2 and that for F_B' after STEP 1; that is, no more variables were found to improve the "goodness of fit" significantly, after these initial steps. Table 4.13 gives the semi-partial correlations at the end of these STEPS. It was unmistakably clear that Dogmatism was a correlate of both factors of attitude to curriculum innovation (F_A' and F_B', respectively). The respective amounts of variance in these factors explained by Dogmatism were approximately 10.5 per cent for F_A' and 18 per cent for F_B'. Attendance on a CRASH COURSE explained approximately 7 per cent of the variance in F_A'. The multiple correlations were approximately 0.40 for F_A' and 0.42 for F_B' so that the corresponding proportions of "explained" variance in the teachers' attitudes to curriculum innovation were approximately 16 and 18 per cent.

4.4.6.3 THE RESULTS OF THE FIRST-ORDER PARTIAL CORRELATION ANALYSES

For the dependent variable F_A', the first independent variables to be considered as possible candidates for variable U in our causal models were PRESENT POSITION and Attendance on a CRASH COURSE because of their significant simple correlations with F_A', (r = -.244 and -.253 respectively). However, as Appendix J shows, these two variables did not correlate significantly with

TABLE 4.13

THE SIGNIFICANT SEMI-PARTIAL CORRELATIONS OF THE SECOND-LEVEL FACTORS (F'_A, F'_B) WITH THE INDEPENDENT VARIABLES FOR THE MAIN FAMILIAR SAMPLE (n = 80) (FROM THE RESULTS OF THE MULTIPLE CORRELATION ANALYSES, APPENDIX J)

Dependent Variables	Independent Variables	Semi-Partial Correlations
F'_A	Dogmatism	-0.3234**
	Attendance on a CRASH COURSE	-0.2687*
F'_B	Dogmatism	-0.4214**

* Significant at the five per cent level ($P_{.05}$ = .217, df = 80)

** Significant at the one per cent level ($P_{.01}$ = .283, df = 80)

Note: The Stepwise Regression Analyses showed that no more variables were significant after STEP 2 for F'_A and after STEP 1 for F'_B

Dogmatism (r = .067 and -.006 respectively); it served no purpose therefore to carry out a first-order partial correlation analysis and test either Model 1 or Model 2 with these two variables incorporated in the models. On the other hand, although Experience of Bureaucracy did not correlate significantly with F_A' (r = -.138), it had a substantial, significant, and positive correlation with Dogmatism (r = .451, $P<.01$) (Appendix J); the more Dogmatic amongst the teachers tended to perceive their "Experience of Bureaucracy" as more SEVERE. It was therefore decided to consider Experience of Bureaucracy as a possible U variable. Table 4.14 shows that the effect of partialling out Dogmatism on the zero-order correlation between "Experience of Bureaucracy" and F_A' was to reduce this correlation to zero. On the other hand, partialling out Experience of Bureaucracy, had only a negligible effect on the zero-order correlation between Dogmatism and F_A'. The only possible a posteriori evaluation of Models 1 and 2 (see chapter 3) therefore was that Model 2 was supported by the data but Model 1 was not (Figure 4.13). The data for the relationships between F_B', Dogmatism, and Experience of Bureaucracy (Table 4.14) also made of Model 2 the appropriate Model (Figure 4.13). However, the importance of these causal relationships was greatly lessened because of the lack of statistical significance for the relationships between Experience of Bureaucracy and the second-level factors of attitude to curriculum innovation.

It was noted that Dogmatism was also significantly associated with SIZE of Polytechnic (r = -.301, $P<.01$; Appendix J). However, because of the near-zero simple correlations between SIZE of Polytechnic and the two factors of attitude to curriculum innovation (r = -.066 and .040 respectively), SIZE of Polytechnic was not

TABLE 4.14

RESULTS OF THE FIRST-ORDER PARTIAL CORRELATION ANALYSES

A. With F'_A as dependent variable

Independent Variables	Zero-order Correlation with F'_A	Independent Variables Partialled Out	
		Experience of Bureaucracy (Q11)	Dogmatism (Q12)
Experience of Bureaucracy (Q11)	-.138	-	.0027
Dogmatism (Q12)	-.311**	-.2814*	-

B. With F'_B as dependent variable

Independent Variables	Zero-order Correlation with F'_B	Independent Variables Partialled Out	
		Experience of Bureaucracy (Q11)	Dogmatism (Q12)
Experience of Bureaucracy (Q11)	-.190	-	-.0002
Dogmatism (Q12)	-.421**	-.3827**	-

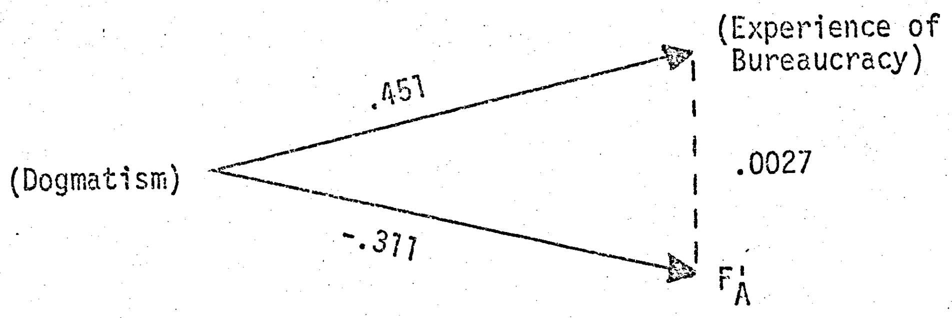
* Significant at the five per cent level ($P_{.05}$ = .217, df = 80)

** Significant at the one per cent level ($P_{.01}$ = .283, df = 80)

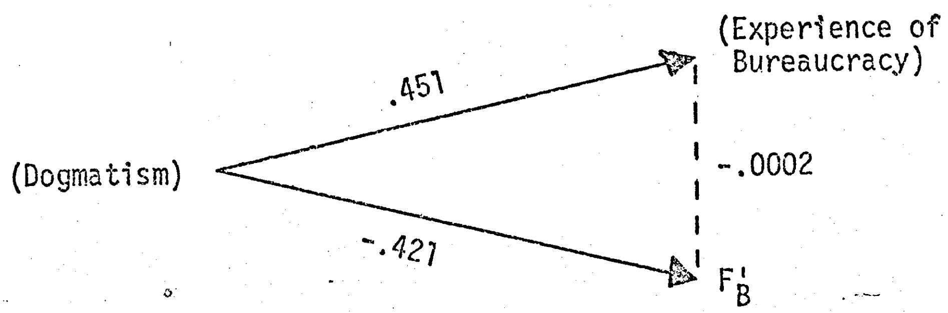
FIGURE 4.13

SIMPLE CAUSAL MODELS FOR THE RELATIONSHIPS BETWEEN DOGMATISM, EXPERIENCE OF BUREAUCRACY, AND THE SECOND-LEVEL FACTORS OF ATTITUDE TO CURRICULUM INNOVATION (IN THE MAIN FAMILIAR SAMPLE)

A. Simple causal model for F'_A



B. Simple causal model for F'_B



(Note: F'_A = Support for the design, content and teaching requirements of the new curriculum

F'_B = Belief in the professional competence of teachers for initiating and implementing curriculum innovation.)

considered as a possible U variable for model-building purposes.

4.4.7 THE SUMMARY DATA FOR THE INDEPENDENT VARIABLES FOR THE MAJOR NON-FAMILIAR SAMPLE

The summary data for the MAJOR NON-FAMILIAR SAMPLE was presented together with the summary data for the MAIN FAMILIAR SAMPLE in order to facilitate comparisons when necessary.

It was clear from Table 4.15 that in both samples, the teachers were on the whole professionally untrained but had been teaching for at least five years. However, those in the MAJOR NON-FAMILIAR SAMPLE were predominantly from small Government Polytechnics whilst those in the MAIN FAMILIAR SAMPLE were predominantly from large Private Polytechnics.

The composition of the two samples differed considerably with respect to the status of the constituent staff. The MAJOR NON-FAMILIAR SAMPLE had a predominance of SENIOR staff (94.5%) in contrast with the balanced composition of the MAIN FAMILIAR SAMPLE (56.25%).

A result of little importance was the absence of Workshop Superintendents; it seemed that we were probably misinformed about this category of teachers.

Table 4.16 gives the means and standard deviations of scores for the continuous independent variables Dogmatism and Experience of Bureaucracy.

TABLE 4.15

SUMMARY DATA FOR THE INDEPENDENT VARIABLES FOR THE MAJOR NON-FAMILIAR SAMPLE: RESPONSE FREQUENCIES FOR THE "BACKGROUND INFORMATION" AND "KNOWLEDGE OF CURRICULUM INNOVATION" VARIABLES

Question Number (Questionnaire Q6)	Background Information Variables and Knowledge of Curriculum Innovation Variables	Categories of Response	Response Frequencies (%)	
			MAJOR NON-FAMILIAR SAMPLE (n = 54)	MAIN FAMILIAR SAMPLE (n = 80)
Q6.A	Type of Polytechnic	Government	70.37 (38)	40 (32)
		Private	29.63 (16)	60 (48)
Q6.B	Size of Polytechnic	Small	61.11*(33)	46.25 (37)
		Large	29.6 (16)	53.75 (43)
Q6.1	Present Position	Demonstrator	5.5 (3)	8.75 (7)
		Junior Instrtr.	- (0)	35.00 (28)
		Senior Instrtr.	3.7 (2)	32.5 (26)
		Workshop Superintendent	- (0)	- (0)
		Associate Lecturer	29.7 (16)	12.5 (10)
		Lecturer	29.7 (16)	5 (4)
		Lecturer in Charge	5.5 (3)	- (0)
		Head of Department	25.9 (14)	3.75 (3)
		Other Senior Staff	- (0)	2.5 (2)
Q6.2	Teaching Experience	Less than five years	11.1 (6)	15 (12)
		Five to ten years	27.8 (15)	55 (44)
		More than ten years	61.1 (33)	30 (24)

Continued

TABLE 4.15 (Continued)

Question Number (Questionnaire Q6)	Background Information Variables and Knowledge of Curriculum Innovation Variables	Categories of Response	Response Frequencies (%)	
			MAJOR NON-FAMILIAR SAMPLE (n = 54)	MAIN FAMILIAR SAMPLE (n = 80)
Q6.3	Professional Training	Yes (Trained	16.7 (9)	16.25 (13)
		No (Untrained)	83.33 (45)	83.75 (67)
Q6.4	FAMILIARITY	Very Unfamiliar	55.6 (30)	- (0)
		Quite Unfamiliar	44.4 (24)	- (0)
		Quite Familiar	- (0)	53.75 (43)
		Very Familiar	- (0)	46.25 (37)
Q6.5	Attendance on crash course	Yes	- (0)	30 (24)
		No	100 (54)	70 (56)

* 5 respondents among the NON-FAMILIAR teachers were uncertain about "Size of Polytechnic"

(NOTE: the numbers in brackets are the actual frequencies).

TABLE 4.16

MEANS AND STANDARD DEVIATIONS OF SCORES FOR DOGMATISM AND FOR EXPERIENCE OF BUREAUCRACY BY DEGREE OF FAMILIARITY

SAMPLES	Dogmatism			Experience of Bureaucracy		
	n	M	SD	n	M	SD
MAJOR NON-FAMILIAR -	54	195.07	30.519	54	45.59	6.93
MAIN FAMILIAR	80	194.6	25.504	80	43.05	7.86

No differences between the sample means were postulated but the results showed that the difference for Dogmatism was within the bounds of chance fluctuations. ('t'= .093, n.s). For "Experience of Bureaucracy" the difference was only of borderline significance. ('t'= 1.971, P<.05). The frequency distributions for these two variables were slightly skewed in this sample (Appendix K).

But the striking result from the NON-FAMILIAR teachers' responses was the replication in the NON-FAMILIAR SAMPLE of the quite extraordinarily high level of Dogmatism observed amongst the FAMILIAR teachers of TAMIL NADU. We have already compared the high level of Dogmatism of the Indian teachers in TAMIL NADU with that reported for other groups in the literature on Dogmatism. Since the NON-FAMILIAR teachers in the three OTHER STATES came from a vast geographical area, such a high level of Dogmatism must imply that some factor inherent in the Indian Technical Teachers sub-culture was at work and probably permeated the teachers' attitudes to life and work.

4.4.8 THE RESULTS OF THE FACTOR ANALYSIS OF THE TEACHERS' RESPONSES TO QUESTIONNAIRE Q7 (FOR THE TEACHERS IN THE MAJOR NON-FAMILIAR SAMPLE)

The results of the Principal Components analysis of the product-moment inter-item correlations for questionnaire Q7 for the MAJOR NON-FAMILIAR SAMPLE are given in Appendix K together with the correlation matrix. Seven factors with latent roots greater than 1 were extracted. From the "scree test", the third factor was the one at which the curve straightened out and only the first three factors were therefore rotated. The results of the Varimax Rotation are given in Table 4.17

TABLE 4.17

VARIMAX ANALYSIS OF THE ITEMS OF QUESTIONNAIRE (Q7) FOR THE MAJOR NON-FAMILIAR SAMPLE

Variables (Q7 items)	Rotated factor loadings I	II	III	Communality (h^2) %
1	.261	.798	-.122	72.1
2	.281	.813	.005	73.9
3	-.324	.581	.119	45.7
4	-.337	.367	-.041	25.0
5	-.718	.118	-.025	52.9
6	.210	.380	.455	39.5
7	.511	.249	.140	34.3
8	-.040	.050	.796	63.8
9	.551	.129	-.130	33.7
10	-.377	-.030	-.056	14.6
11	.461	-.108	-.232	27.8
12	-.115	.482	-.658	67.8
13	-.168	-.470	.069	25.4
14	-.177	.234	-.484	32.1
15	.511	-.024	-.009	26.2
16	.618	-.226	.031	43.4
17	.569	-.104	.502	58.7
Percentage Variance	17.0	15.2	11.1	

Note:
Factor I was denoted as I:V (7A)'
Factor II was denoted as I:V (7B)'

The coefficient of congruence (Ø) for the first factors I:V(7A) and I:V(7A)' was .69 and these two factors were therefore taken to be congruent to an acceptable degree. (See Appendix K). When both factors were represented by the same composite variable (f_1) (that is, by items 9, 10, 11, 16, 17 of Q7), the coefficient of congruence when calculated for these five items only was as high as .993 (Appendix K).

The coefficient of congruence (Ø) for the second factors I:V(7B) and I:V(7B)' was only .22. Consequently, the composite variable (f_2) (which represented I:V(7B)) could not be utilised for our purposes in the present chapter. The striking feature of the second factor I:V(7B)' in the MAJOR NON-FAMILIAR SAMPLE (as compared with the second factor in the MAIN FAMILIAR SAMPLE) was the association of a general feeling of welcome for curriculum innovation (items 1 and 2 of Q7) with feelings about specific issues like the involvement of practising teachers in innovation (item 12) and the relevance of subject matter (item 3). Such an association contrasted with the surprising dissociation in the minds of the FAMILIAR teachers of a general feeling of welcome for innovation from feelings about any specific issues except that of finding time for innovation (item 9) (see Section 4.4.2).

The frequency distribution for (f_1) (Appendix K) showed that slightly less than half of the sample were non-committal, and scored between 14 and 16. An important feature of the distribution was its departure from normality. Nevertheless, we proceeded with the subsequent MULTIPLE CORRELATION analysis, the assumption being again that the underlying distribution for (f_1) in the population of Engineering Drawing teachers in SOUTH INDIA was normal.

4.4.9 THE RESULTS OF MULTIPLE CORRELATION ANALYSIS (III) (IN THE COMBINED GROUP)

Table 4.18 gives the higher-order semi-partial correlations for FAMILIARITY and Dogmatism. These were the only two independent variables which correlated significantly with the dependent variable (f_1) in the COMBINED GROUP. The results supported sub-Hypothesis II.

TABLE 4.18

THE SIGNIFICANT SEMI-PARTIAL CORRELATIONS OF (f_1) WITH THE INDEPENDENT VARIABLES FOR THE COMBINED GROUP (n = 134)

Dependent variable.	Independent variables	Semi-partial Correlations
f_1	FAMILIARITY	0.2578 **
	Dogmatism	-0.3437 **

** significant at the one per cent level.

Note:

a. f_1 = Belief that teachers should take the initiative in curriculum innovation.

b. the Stepwise Regression Analysis showed that no more variables were significant after STEP 2.

The Multiple correlation was 0.41. Hence, the total amount of variance in (f_1) scores explained by Dogmatism and FAMILIARITY together was approximately 17 per cent, with FAMILIARITY accounting for approximately 6 per cent.

The summary of the Stepwise Regression Analysis is given in Appendix K.

4.5 THE ANALYSIS OF RESULTS

Our first-level factor analysis then had provided us with nine interpretable factors, two of which (f_5, f_6), however, were simply informing us of the degree of innovativeness of the TTTI materials. The remaining seven factors mapped out (at least in part) the universe of content for the teachers' attitudes to curriculum innovation.

An interesting feature of our method of utilizing more than one item for measuring a particular dimension of attitude was that the asymptotic normal properties could manifest themselves. This was evidenced by the frequency distributions of the scores for each composite variable (Appendix I) except for (f_3), (f_5) and (f_6) which represented the factors I:V(8A), I:V(9A) and I:V(9B) respectively. However, since the last two of these were not utilized for the subsequent derivation of second-level factors of attitude to curriculum innovation, the negative skewness which characterized them was of no consequence in the present study. As for I:V(8A), the composite variable (f_3) which defined it had relatively low loadings on the two second-level factors of attitude and it was not taken to represent either of these two.

However, it was a slightly disturbing feature of our results (in view of our use of product-moment correlation coefficients for generating our item groupings) that the frequency distributions for the single items of our questionnaire on curriculum innovation were suggestive of an absence of normality (Appendix H). As we have explained, the assumption of normality which was made was with reference to the "underlying" distributions and not to the particular items that gave access to these distributions. Because a particular item did not have a frequency distribution that looked like a normal curve, it did not follow that it did not have a basic underlying dimension that was normal. It did mean, however, that such an item represented the underlying dimension in only a limited way. Bi-modal distributions (eg, Q8, items 7 and 12; Q10, items 9 and 10) and skewed distributions (eg, Q7, items 1 and 2) tended to cause an overestimation of inter-item correlation coefficients.

Turning now to the results of the second-level factor analysis and taking F_A first, this factor seemed to be a dimension of beliefs about the innovative materials themselves. Teachers who scored positively on F_A were likely to be those who, on the whole, favoured the new subject matter, the new ways of "testing" achievement, the new teaching techniques and so on. They were in favour of the "diffusion" of the new ideas in the "User Sub-SYSTEM". In addition, large classes and insufficient time at work for lesson preparation, did not seem to present problems to them when implementing the innovation. F_A was thus about the "nuts and bolts of curriculum reform" (Derricott and Hall, 1971). It was a factor of teachers' attitudes to novelty in the practice of teaching, (we might say, the craft of teaching!).

Given that the innovation in India was limited to a highly specialized subject and for a particular academic level, comparisons with other studies in the field of teachers' attitudes could only be very tentative. Nevertheless, Taylor's (1970) findings on how teachers planned their courses threw some light on the nature of F_A. Taylor showed that a number of first-order "factors" (in the psychometric sense) seemed to underlie the thinking of school teachers when asked about how they planned their courses.

He labelled the first of these "factors" the "teaching context". The factor content for this first factor showed that for teachers a "plan" was in the main a guide or statement about the teaching methods to be employed, the materials and resources to be used, the ordering of subject matter and the use of teaching time. The second of the factors found by Taylor had to do with the "learning situation": what pupils were intended to learn and "the knowledge, principles and skills to be achieved". It could be said, that these two factors were important facets of the consciousness of teachers when planning their lessons. Now, F_A seemed to reflect the teachers' concern about innovation in both the "teaching context" and the "learning situation". It seemed to be about innovation in the teaching-learning transaction and this could be an alternative interpretation for F_A. An interesting point which emerged from Taylor's research and ours was that this concern seemed to be shared by school teachers in England as well as by the teachers of Engineering Drawing in India. It was therefore a legitimate procedure for us to use the same attitude statements that indexed F_A in India with the secondary school teachers of mathematics in England as we did in our Replication Study in chapter 6.

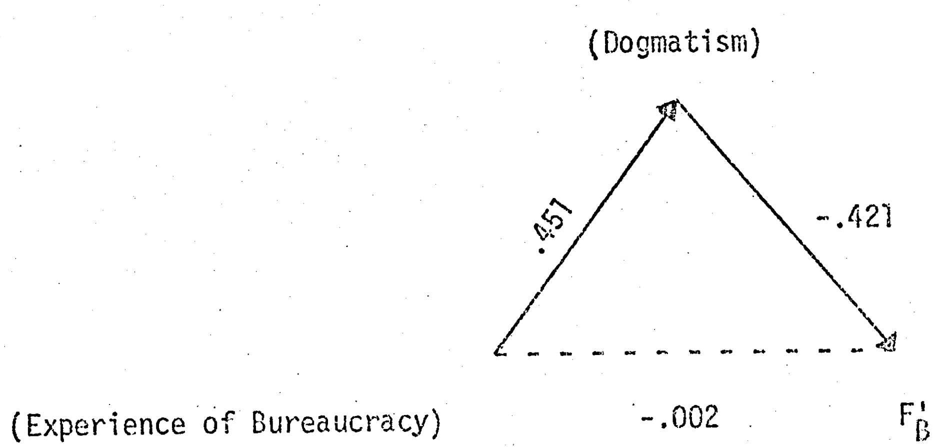
The interpretation of F_B was also frankly subjective but it was based on the observed association between two beliefs: the belief that teachers should take the initiative in curriculum innovation (f_1) and the belief that teachers needed confidence in teaching the NEW CURRICULUM materials (f_9). Teachers who believed that curriculum innovation should be the responsibility of Polytechnic instructors/lecturers themselves and not that of other bodies such as Technical Teacher Training Institutes (f_1; Q7: items 10, 11) tended not to believe that they needed plenty of guidance in the preparation of teaching aids to implement the new curriculum materials (f_9; Q10: Item 10) and that the new materials gave them confidence in their teaching (f_9; Q10: Item 3). Teachers who took the opposite point of view were likely to think that it was a waste of time for them to try new ideas (unless their heads of departments approved of these ideas), that they had no time for curriculum innovation, and that there was no incentive to initiate curriculum innovation (f_1; Q7: Items 16, 9, 17); in addition, they welcomed the guidance of the innovators (f_9; Q10: Item 10). In examining the factor content for F_B it seemed to us that what was at stake was the teachers' perceptions of their own professional competence in relation to curriculum innovation and the extent to which innovators should consider this question of professional competence in the management of curriculum innovation. It was well known that an individual's feeling of competence was a strong motivating force whether it was a general feeling of competence as an individual or a feeling of competence particularly related to his role as a teacher (Guskin 1971). Matthijssen (1969) has drawn attention to two motives underlying professionalization in education. There was firstly the motive to professional specialization; the implication here was that the teacher was pre-eminently an expert in the subject which we taught, specially in secondary and higher education. Secondly, there was the "pedagogic motive". The implication in this instance was that teachers should have a certain amount of autonomy with regard to such things as the choice of subject matter to be taught, the choice of teaching aids, the treatment of the subject matter and so on. It seemed to us that underlying both of these motives was the notion of professional competence. However, although from our results this notion of competence appeared to be a major factor, no clear expectations emerged from the fragmentary and somewhat contradictory research findings in the relevant literature as to whether a feeling of competence in an individual was likely to facilitate or inhibit his acceptance of change. There was the argument that individuals with confidence in their abilities were more prone to try innovations and be willing to evaluate new knowledge. But there was also the counter-argument that teachers who felt competent might desire not to accept change from "outsiders" as an attempt to assert their own feeling of competence in determining their work.

Broadly speaking, the issues on which the two second-level factors centred were those of <u>content</u> and <u>method</u> (or form) of curriculum innovation. "Content" here referred to the innovative support materials themselves; "method" referred to the way by which the innovation was managed: that is, how it was initiated, implemented, monitored and shaped into a particular form. It seemed from our findings that in perceiving an "object" like curriculum innovation, teachers were analytical and discriminating in their judgements; in other words, "content" and "method" were differentiated and the teachers' responses to one factor were independent of their responses to the other.

Klieband (1974) has remarked that there was some promise of new directions in curriculum theory through the development and analysis of metaphorical elements of language and thought in curriculum. Assuming that he was right and given that "content" and "form" belonged to the language of art, we wondered whether the notion of curriculum innovation as an object of art held promise for a better understanding of its creation, and of its evaluation. For it seemed that just as an object of art embodied certain values (Reid, 1961), a curriculum development project too embodied certain values (those of its innovators) and the evaluation of such a project became not unlike that of criticism in the study of historical works of art. The critics of historical works of art find out what they can of the cultural atmosphere, the techniques and the assumptions of a particular period. This seemed to us to be rather like the users of the "evaluation as illumination" paradigm (Parlett and Hamilton, 1972) who also find out what they can about the "learning milieu" of a particular innovation. But this particular line of thought was not pursued further in this chapter because it could distract from the main aim of the chapter.

The results of Multiple Correlation Analyses (I) and (II) gave considerable support to our postulate of a significant and negative correlation between Dogmatism and <u>each</u> of the two second-level factors of attitude to curriculum innovation.(Sub-Hypothesis (I)). Regarding the unexplained variance in the teachers' attitudes to curriculum innovation, such variance could be attributed to error but it seemed probable too that some of it could be accounted for by characteristics of the innovative context which were not included in the analysis. As we have already indicated, the contribution of such characteristics was to our way of thinking no less important and chapter 5 showed our attempt to study these as well.

With regard to the simple correlations between the SITUATIONAL variables and the attitude factors, and taking first, the teachers' attitudes concerning their own professional competence to initiate and implement curriculum innovation (F_B'), an interesting finding was that only Teaching Experience and Experience of Bureaucracy had correlations with F_B' which were not zero or near zero ($r = -.165$ and $-.190$ respectively). Neither of these correlations was statistically significant. But because both these variables had to do with EXPERIENCE within the profession, the suggestion seemed to be that the teachers' attitudes as measured by F_B' were coloured not only by their own levels of Dogmatism but also to some extent by the sheer EXPERIENCE of working in the Polytechnics. However, as our causal model (Figure 4.13) implied, the influence of Dogmatism was probably a pervasive one. It accounted for the observed correlation between Experience of Bureaucracy and F_B' since that correlation was considerably reduced when Dogmatism was partialled out. On the other hand, our causal model was only acceptable if Dogmatism was assumed to be a variable which was antecedent not only to the teachers' attitudes to curriculum innovation but also to their Experience of Bureaucracy. Otherwise, it was possible using exactly the same data to postulate a quite different model with Dogmatism playing a mediating role thus:



In this model, Dogmatism intervened between the teachers' perceptions of working conditions (that is, their Experience of Bureaucracy), and their reactions to the innovation. In no way did this model belittle the importance of Dogmatism; this seemed to be paramount. But at the same time no definite unambiguous causal model of the relationship between F'_B, Dogmatism and Experience of Bureaucracy emerged, and a thorough evaluation of our proposed causal model (Model 2) required that this third alternative model be also studied. Such a study meant testing alternative hypotheses corresponding to the models. But it was not our aim to test the hypotheses that were implicit in the models because our discussion of these hypotheses could only rest upon guesswork since there were no theoretical formulations to guide our propositions. The relevance of this discussion then was simply that causal connections could not be inferred solely from empirical evidence and that consequently, our causal model (Model 2) was only a tentative one.

It went without saying that the same argument about hypothesis testing and model-building applied in the case of F'_A also. However, for F'_A, there were two independent variables apart from Dogmatism which had significant, zero-order correlations with it. These two independent variables were PRESENT POSITION ($r = -.244$; $P<.05$) and Attendance on a CRASH COURSE ($r = -.253$, $P<.05$). But these variables were not incorporated as U variables in causal models because they were not linearly associated to Dogmatism; their correlations were respectively .084 (after correction) and -.006. Nevertheless, their significant correlations with F'_A on the one hand and their near-zero correlations with F'_B on the other hand served to draw attention to the distinction between the two fundamental dimensions of the universe of teachers' attitudes to curriculum innovation, that is, F'_A and F'_B. The interpretation of the correlation of F'_A with PRESENT POSITION was not so straightforward because, as explained above, in India PRESENT POSITION and AGE were apparently highly correlated in the teaching population. It was difficult to decide whether the observed negative association between PRESENT POSITION and attitude to the "content" of curriculum innovation was a matter of ageing or of the attributes of PRESENT POSITION, that is, of Status.

In evaluating the results obtained in the COMBINED GROUP for our Multiple Correlation Analysis (III), the weaknesses of this part of the present chapter must be emphasised. The research design used for testing sub-hypothesis (II) arose out of practical necessity. However, it seemed to be the only possible "action research" design that would suit the particular conditions under which we undertook the study in India. A serious weakness of the design was the lack of control of the error variance due to regional differences between Tamil Nadu and the Other States; these regional differences might come, for example, through the very style of the administration of Technical Education in the different states of South India. Amongst the other weaknesses, there was the low reliability of the composite variable (f_1).

Nevertheless, in spite of these deficiencies and limitations it was possible to determine the proportion of the variation in teachers' attitudes to curriculum innovation in <u>general</u> which could be explained by their FAMILIARITY with a <u>specific</u> curriculum innovation when other correlates of these attitudes were partialled out. This proportion amounted to only six per cent approximately. However, the results of our factor analyses of the Q7 responses in the MAJOR NON-FAMILIAR and MAIN FAMILIAR SAMPLES also showed that there was a definite but not very marked dislocation of the teachers' perceptual framework as a consequence of FAMILIARITY.

CHAPTER 5

The quasi-illuminative study: three investigations into the innovative context in TAMIL NADU.

(STAGE A, PART II)

5.1 INTRODUCTION

In the present chapter we report the results of our attempt to throw more light on the Polytechnic teachers' reactions to the curriculum innovation in Engineering Drawing in TAMIL NADU. The rationale for this "quasi-illuminative" study was described in Chapter 3. The overall aim was to obtain some idea of other SITUATIONAL variables which might inform us about the variance in the teachers' attitudes (to curriculum innovation) which remained "unexplained" by our Multiple Correlation Analyses in Chapter 4.

Three investigations into the innovative context were undertaken. These were as follows:-

1. An investigation into the PASS RATES for the External Examinations in Engineering Drawing for the years 1972 and 1973.
2. A FIELD STUDY which consisted of on-site conversations with teachers and of observations of their classroom behaviours.
3. An investigation into the extent to which the teachers' attitudes to the NEW CURRICULUM were in conflict with their attitudes to the TRADITIONAL CURRICULUM.

5.2 THE INVESTIGATION INTO THE PASS RATES FOR THE EXTERNAL EXAMINATIONS IN ENGINEERING DRAWING FOR 1972 AND 1973

5.2.1 THE DIFFERENCE IN PRE- AND POST-INNOVATION PASS RATES IN THE EXTERNAL EXAMINATIONS

The paucity of the information which was at our disposal did not allow us to make a detailed study of the examination results for Engineering Drawing and of the impact of the innovation on these results. It seemed to us that a study of this impact required a detailed knowledge of the examination system in TAMIL NADU and of the examination results for some five years before and after the introduction of the curriculum innovation. Our interest in the examination results was limited to determining whether there was a significant difference between the PASS RATE in 1972 (i.e. before the innovation) and the PASS RATE in 1973 (after the innovation) because our assumption was that the first examination results after the introduction of the innovation would greatly influence the teachers' perspective of the innovation and, consequently contribute to the formation of their attitudes to it.

Working also on the assumption that the innovative TTTI curriculum (course) materials improved the teaching-learning process, as the innovators had implied (Appendix A), we expected the percentage of passes in the 1973 External Examination (i.e. at the end of the first year of innovation) to be significantly higher than the percentage of passes in the 1972 examination, (after necessary adjustments had been made to the 1973 examination marks to take into consideration differences in means and standard deviations between the 1972 and the 1973 examination marks).

But our expectation was not based solely on the innovators' claim. A special examination paper had been set for the NEW CURRICULUM (see Appendix A). The paper had a "new look" about it and matched the testing strategies advocated in the innovative support materials (although, admittedly, we were not qualified to judge the newness of the examination content). Furthermore, we understood from our "FIELD STUDY" (described later in this chapter), that the Polytechnic staff thought that the new Engineering Drawing curriculum treated the subject matter more "systematically" than the traditional one, and that the examination results were therefore expected to be better than in the pre-innovation years.

However, it seemed that it was not mandatory on the Polytechnics to take the new style examination paper and consequently the examination results for 1973 were based on the performance of students partly on the old style examination paper and partly on the new style examination paper. As those who sat for the new style examination paper were not identifiable from our data, it was therefore not possible to compare their examination performance with that of students who took the old style paper.

But a question still remained and that was whether any observed difference in PASS RATES happened by chance or whether there was a relationship between the PASS RATE and the EXAMINATION YEAR for the Years 1972 and 1973. We postulated that there was a relationship. The hypothesis was that the PASS RATE in 1973 was significantly higher than the PASS RATE in 1972. This hypothesis was stated in operational terms in Section 5.2.3 below, and was verified by the χ^2 test.

The value of χ^2 was a measure of the departure of the observed percentage of passes for each year from the percentage of passes expected by chance. Figure 5.1 shows how it was possible to calculate χ^2 using the usual formula.

However, although it was possible to establish in this way whether the Pass Rate in 1973 was significantly different from the PASS RATE in 1972, it was not possible to infer from a significant value for χ^2 that the difference in PASS RATES was attributable to the innovation.

FIGURE 5.1

DIAGRAM FOR STUDYING THE RELATIONSHIP BETWEEN EXAMINATION YEAR AND PASS RATE

(PASS RATE)	Examination Year		
	Year 1972 (Pre-innovation)	Year 1973 (Post-innovation)	
Number of Passes	a $\frac{N_1}{N_1 + N_2} (a + b)$	b $\frac{N_2}{N_1 + N_2} (a + b)$	$a + b$
Number of Failures	$N_1 - a$ $\frac{N_1}{N_1 + N_2} \left[(N_1 + N_2) - (a + b)\right]$	$N_2 - b$ $\frac{N_2}{N_1 + N_2} \left[(N_1 + N_2) - (a + b)\right]$	$(N_1 + N_2) - (a + b)$
	N_1	N_2	$N_1 + N_2$

Note: 1. a and b were the observed numbers of PASSES; within the cells the observed numbers of PASSES or FAILURES were on the top line and the expected numbers on the bottom line.

2. $\chi^2 = \sum \frac{(O - E)^2}{E}$ where O = Observed frequency for each cell
E = Expected frequency for each cell.

3. N_1 and N_2 were the number of examination candidates in 1972 and in 1973, respectively.

The analysis described here was not designed to make this inference.

Moreover, presumably what influenced most of the teachers was not a sophisticated statistical analysis of the PASS RATES but the raw data itself, that is, the number of students in <u>their</u> Polytechnics who actually passed the examinations in 1972 and in 1973 respectively. Now, the TAMIL NADU teachers had already had the examination results at the time of our second visit to India in July 1973 shortly after the beginning of the new academic year in the Polytechnics and at the start of the second year of the innovation. They must have been influenced by these results but the point was whether the examination results which were available to those teachers reflected truthfully the superiority or inferiority of the NEW CURRICULUM relative to the TRADITIONAL CURRICULUM. However, it was not possible to obtain details of the examination results for <u>each</u> Polytechnic. Only the global results for the whole of TAMIL NADU were given to us. In the circumstances we could only assume that the pattern of results which we obtained from our analyses was common to all the Polytechnics - a very strong assumption indeed!

5.2.2 THE DIFFERENCE IN THE PREDICTION OF THE PRE- AND POST-INNOVATION EXAMINATION RESULTS ON THE BASIS OF THE INTERNAL ASSESSMENTS

Even before the introduction of the innovation in Engineering Drawing, a complex system of Internal Assessments or "Sessional marks" had been evolved in TAMIL NADU. Fifty per cent of the Internal Assessments was given for "tests" that were set periodically and forty per cent of the assessments for a number of "assignments" and "tutorials". These were defined respectively as "work done by students on their own" and as "work done by students under guidance by teachers". The remaining ten per cent of the Internal Assessments was for attendance and punctuality.

Officially, these Internal Assessments were not taken into account in "declaring the results" of the examination (Government of Madras, 1966). However, as far as the curriculum innovation was concerned, there was no doubt in the innovators' minds as to the necessity of regular and systematic testing. As we noted in Appendix A, many different types of criterion test questions were included in the innovative "Support Materials" so that teachers would be able "to evaluate both the amount and quality of learning" and also how well they had taught. Tawney (1976) has made the point that in a curriculum development project involving a public examination, tests and internal examinations formed a "natural means of evaluation" and served "to provoke discussions" at which objectives were clarified and value positions revealed. In the words of the innovators at TTTI, achievement testing was "a tool" which the teacher could use "to improve his own teaching". Tests and exercises for each "unit" of study were to be administered "at the times shown". In fact as Appendix A shows, the suggested "lesson plans" in the support materials gave details of the schedule of activities and included a time allocation for tests and the placement of the tests in the programme of study. At the end of each test, students were to be given "knowledge of results" - a "powerful factor" in motivating students (!) Given the value placed on student activity and on testing in the innovation, we expected that the continuous involvement of teachers in students' progress and their interaction with the students' output would be reflected in better students' overall performance as measured by the internal assessments.

But the really important point for the teachers was whether their Internal Assessments were better predictors of success in the External Examination after the innovation and our assumption was that the comparison between the predictive effectiveness of the Internal Assessments before the innovation and the predictive effectiveness after the innovation, would influence the teachers in their responses to the innovation.

We expected the predictive effectiveness of the Internal Assessments to be better after the innovation. Good prediction was to some extent a vindication of the teachers' professional judgment. If curriculum innovation improved the effectiveness of prediction of a teacher's assessments he would be more favourably inclined to accept it; the hedonic value of the innovation would thus be enhanced. If not, the teacher would view the innovation with uncertainty and reservation, not to say suspicion.

Given the whole paraphernalia of lesson planning and of testing procedures (with innovative support materials en masse) which surrounded this particular curriculum innovation, it was legitimate to expect the teachers' "internal assessments" to be better predictors of success in the post-innovation year of 1973 than in the pre-innovation year of 1972. Our reasoning rested on the argument that the teachers' evaluation of their students' abilities in Engineering Drawing would have been considerably sharpened and their testing skills improved through implementing the recommended programme of testing. In other words, the teachers' assessments of their students' performance would have become less subject to randomness. A simple and quick way of investigating the teachers' predicitons was to analyse the yearly PASS RATE as shown in Figure 5.2. The percentage of correct predictions could be obtained by totalling the respective percentages in cells (a) and (d). According to our reasoning (a+d) would be greater in 1973 than in 1972.

FIGURE 5.2

DIAGRAM FOR STUDYING THE PREDICTION OF EXTERNAL EXAMINATION RESULTS ON THE BASIS OF INTERNAL ASSESSMENTS

		Pass Rate in External Examination	
		Pass (%)	Fail (%)
Pass Rate based on Internal Assessments	Pass (%)	a	b
	Fail (%)	c	d

It would have been possible (from the pre-innovation and post-innovation data) to determine the relationship between the examination marks and the sessionalmarks by applying the chi-square test to the proportions of correct predictions; we could even have derived separate regression equations in which the examination marks were the dependent variable and the sessional marks the independent variable and calculate the amount of predicted variance in the examination marks for the two years 1972 and 1973 respectively. However, the variability between Polytechnics in their systems of Internal Assessments was assumed to be so great as to make pointless a rigorous treatment of the data which we had in our possession. For the same reason our analyses concerning the predictive effectiveness of the Internal Assessments was unhypothesised. Moreover, presumably what teachers perceived as important was the sheer number of students who passed or failed from year to year and the accuracy of their predictions on the basis of their own Internal Assessments. In this context the statistical significance of a difference in predictive effectiveness was probably not a very meaningful issue; professionally, every wrong prediction mattered even if it was a chance happening. It seemed reasonable to suppose that a teacher's attitude to the innovation would be affected by every unit increase or decrease in the number of his students who did not perform as expected in the examinations.

5.2.3 STATEMENT OF SUB-HYPOTHESIS (III)

Sub-Hypothesis III was stated in operational terms as follows: For the Engineering Technician students (in TAMIL NADU) who were examined in Engineering Drawing in 1972 and in 1973 respectively, the percentage of Students who passed in 1973 was significantly higher than the percentage of students who passed in 1972.

5.2.4 THE PROCEDURES (THE PROCEDURES FOR COLLECTING THE DATA, THE SAMPLING PROCEDURES AND THE ANALYTICAL PROCEDURES.)

The examination marks for 1972 and for 1973 were handed in to us in person by the Controller of Examinations himself at the Office of the Director of Technical Education in Madras. The data was presented to us in the form of two booklets, one for each year. Each booklet contained both the Internal Assessments (or "sessional marks") and the "actual" Examination Marks. The total number of examination candidates was 3051 for 1972 and 3167 for 1973.

The analytical procedure for testing Sub-Hypothesis III consisted simply (as explained above) in calculating the value of χ^2 in order to determine whether a departure of the observed PASS RATE in 1973 from the expected PASS RATE happened by chance.

The analytical procedure for comparing the effectiveness of the Internal Assessments as predictors of sucess in the External Examinations for the years immediately prior to and after the introduction of the innovation was also explained above.

The official PASS MARK for the External Examinations was 35% and for the Internal Assessments 50%.

5.2.5 THE RESULTS

The results for the analysis of the PASS RATES for the Years 1972 and 1973 are given in Table 5.1.

Appendix L shows how the official PASS MARK of 35% was converted to give a PASS MARK of 32% for the Year 1973. However, as far as the teachers were concerned the examination results were based on a PASS MARK of 35% and these were the examination results that they knew. Consequently, the analysis of results reported in the text were those obtained with the PASS MARK fixed at 35% for 1973.

Table 5.1 showed that there was a significant difference between the observed and the expected number of passes ($\chi^2 = 7.49$, $P<\cdot01$, df = 1) and consequently, the deterioration in the PASS RATE from 80.4 per cent in 1972 to 77.5 per cent in 1973 was significant. In point of fact, with the PASS MARK adjusted to 32% for 1973, the PASS RATE was 81.4%, a slight increase over the 1972 PASS RATE. However, this improvement in the PASS RATE was not statistically significant ($\chi^2 = 1.066$, Appendix L). Sub-Hypothesis III was rejected.

It was also apparent from Table 5.2 that the curriculum innovation in TAMIL NADU had not had a significant impact on the prediction of the Examination marks based on the teachers' Internal Assessments.

TABLE 5.1

THE RELATIONSHIP BETWEEN PASS RATE AND EXAMINATION YEAR

		Examination Year		
		Year 1972 (Pre-innovation) PASS MARK: 35%	Year 1973 (Post-innovation) PASS MARK 35%	
(PASS RATE)	Number of Passes	2453 (2409)	2456 (2500)	4909
	Number of Failures	598 (642)	711 (667)	1309
		3051	3167	6218

$\chi^2 = 7.49$ ($P_{.01} = 6.63$, df = 1)

(Note: the expected frequencies are in brackets)

TABLE 5.2

THE RELATIONSHIP BETWEEN THE EXAMINATION MARKS AND THE INTERNAL ASSESSMENTS

A. FOR THE PRE-INNOVATION YEAR 1972

		Examination Marks		
		Pass (P') (marks > 35%)	Fail (F') (marks < 35%)	
Internal Assessments	Pass (P) (marks > 50%)	2391 (78.4%)	558 (18.3%)	2949 (96.7%)
	Fail (F) (marks < 50%)	62 (2%)	40 (1.3%)	102 (3.3%)
		2453 (80.4%)	598 (19.6%)	3051 (100%)

B. FOR THE POST-INNOVATION YEAR 1973

		Examination Marks		
		Pass (P') (marks > 35%)	Fail (F') (marks < 35%)	
Internal Assessments	Pass (P) (marks > 50%)	2440 (77.05%)	698 (22.04%)	3138 (99.09%)
	Fail (F) (marks < 50%)	16 (0.5%)	13 (0.41%)	29 (0.91%)
		2456 (77.55%)	711 (22.45%)	3167 (100%)

(Note: for each year the percentages in brackets were based on the total number of examination candidates for that year).

For 1972, the performance in the Examinations of 79.7% of the students (the sum of percentages in the P.P'and F.F' cells) was according to the teachers' expectations, to judge from the teachers' Internal Assessments. The corresponding percentage in 1973 was only 77.46%, a drop of approximately 2¼%.

However, a result which in our opinion was likely to affect the teachers' responses to a considerable extent and adversely was the sheer number of students in the P.F'cells who were expected to pass on the basis of their Internal Assessments but who in the event failed the examination. This number was 558 in 1972 (i.e. 18.9% of 2949, the total number expected to pass) and rose to 698 (i.e. 22.2% of 3138 the total number expected to pass) in 1973. Assuming that these results were reflected evenly in the Polytechnics at the level of individual classes, then in 1972 for a class of, say, 30 students about 5 or 6 students of those who were expected to pass on the basis of their Internal Assessments, in fact failed; in 1973 this figure rose to 6 or 7. Such a small difference could be seen by teachers as happening by chance with the result that the innovation would not have been seen as making a substantial difference in the effectiveness of their Internal Assessments as predictors of examination performance. However, assuming that some teachers had high expectations about the ultimate outcome of the innovation, that is, about the examination results, these same teachers would have experienced a sense of uncertainty concerning the validity of the innovation.

Table 5.3 shows that the ratio of the variance in the Internal Assessments for the years 1972 and 1973 was greater than expected by chance ($F=2.05$, $P<\cdot01$). But as we have already remarked the difficulty

TABLE 5.3

COMPARISON OF THE INTERNAL ASSESSMENTS FOR THE YEARS 1972 AND 1973

	n	M	SD	F ratio
Year 1972	3051	65.27	13.9	2.05
Year 1973	3167	67.58	9.71	

in comparing the post-innovation Internal Assessments with the pre-innovation assessments was that the latter were subject to considerable variations from Polytechnic to Polytechnic in the very manner in which these assessments were given; there were no standard procedures as in the case of the post-innovation assessments. However, the interesting facet of these Internal assessments was the considerable narrowing down of the range of scores after the introduction of the innovation; it seemed that the innovatory system of monitoring students' learning and progress with its more standardised procedures might have had as effect a greater precision in the allocation of marks during the first year after the innovation.

However, it is probable that not only the testing devices but indeed the whole of the new learning package with its gamut of new type teacher-learner relationships, learning processes and classroom transactions could have contributed to the raising of the overall level of the students' performance as assessed internally.

5.2.6 THE ANALYSIS OF RESULTS

Such as they were then, the Examination results in the first year immediately following the introduction of the curriculum innovation pointed to no clear superiority of students' learning outcomes under the new régime. Nor did there seem to be any improvement in the effectiveness of the Internal Assessments as predictors of success in the Examinations. However, the lack of official information about the Examination system and about the system of Internal Assessments did not permit us to be bold about making firm inferences on the basis of these very limited analyses. In any case, the objective of the analyses in this section of the present study was simply to unveil to some extent one particular aspect of the complex pattern of influences on the teachers' responses to the curriculum innovation.

But whilst our analysis was deliberately directed towards the discovery of differences which might have influenced the teachers' responses to the innovation, it was likely that the educational administrators in TAMIL NADU would be looking at these same results essentially in terms of the immediate improvement in the Examination PASS RATE following the implementation of the innovation. And thus, the administrators were likely to take a more grim view of the examination results and stress the lowering of the PASS RATE overall from 80.4% in 1972 to 77.55% in 1973 (Table 5.1). If this were so, it was to be expected that the administrators would regard the innovation with some doubt and suspicion. Such a reaction on their part would inevitably have grave repercussions on the allocation of resources and on the provision of facilities for the innovation. Constraints could be imposed on the innovation and resources channelled away from it. Thus, the examination results, when viewed as part of the evaluation of the innovation could have had serious implications for the innovation, specially at the beginning of the second year of the innovation when we were engaged in our research. It was against this background that the teachers' responses were collected. But we still had to see some teachers at work in the field to gain an even clearer picture of this background. This we did and we report our findings in the next section below.

5.3 THE FIELD STUDY

5.3.1 INTRODUCTION

As we explained in Chapter 3, the purpose of the FIELD STUDY was to make on-site observations of teacher classroom behaviours and to converse with teachers in order to identify a few points of contrast between the "model" of the innovation (as described by the innovators) and its implementation. The assumption was that in this way we would be better able to fathom out the depth of feeling among the teachers towards the innovation.

It seemed to us possible to transfer the concept of the "hidden curriculum" into the field of curriculum innovation and to come up with the concept of a HIDDEN curriculum innovation. This concept expressed succinctly the idea that in TAMIL NADU there was not just the formal innovation as laid out by the innovators and by the Directorate of Technical Education in TAMIL NADU but that there was an innovation which teachers and students worked to, shaped by practical necessities. That was the one about which we wanted to obtain more information.

The "gap" between "intent" and "practice" and the conflict that this gap created have already been referred to in Chapter 2. ORMELL (1973) has remarked that the gap between the originators' concept of new curriculum materials and the teachers' was rather like the variations between different pianists' interpretations of a concerto! According to him the size of the "interpretation gap" was of importance in determining whether the results of an innovation were valid. Ormell did not however discuss any method for determining the precise relationship between this "interpretation gap" and the outcomes of a particular innovation.

In the present study, given that the Polytechnics were "formal organizations" and that the innovation was mandatory, we did not expect to find too many modifications, extensions and selective treatments of the innovative materials. However, differences in the evolution of the innovation within the Polytechnics might be expected to produce certain disparities between the Polytechnics; and we were interested in finding out those classroom variations which the teachers had brought to the innovative curriculum "package". But we had to admit to ourselves that however hard we tried to take in all of the classroom happenings, certain aspects of the innovation were bound to remain hidden from our perception because of the disturbance caused by our very presence in the classroom.

However, we were not only interested in the "gap" between the "model" of the innovation and its implementation in practice but we wanted also to collect instances of "resistance to change". There was no question of attempting an in-depth analysis of any resistance to change once we had inferred its presence. We have seen earlier in Chapter 2 that resistance to change could be rooted in PERSONALITY and consequently only a clinical study of teachers' attitudes to innovation could probably unravel the cause of its presence.

In view of these considerations and given the circumstances in which the FIELD STUDY was made (see below), it seemed that all that we could do was to identify those teachers' behaviours and statements which could be interpreted as being manifestations of resistance to change. But such identifications and inferences were to be made at the stage of the data analysis because we had a limited preconception of what these behaviours or statements might be. We did not want to equip ourselves with over-elaborate, pre-set checklist(s) because these might focus our attention unnecessarily over just a few specific points; and thus, for the FIELD STUDY our approach to the identification of resistance to change was quite different from our approach in Chapter 4. In that chapter, resistance to change was inferred from a negative attitude to curriculum innovation as defined operationally by a given score on a first-level or second-level factor of attitude to innovation. But in the FIELD STUDY no such measures were contemplated.

5.3.2 THE GENERAL PROCEDURES

Nine of the twenty-four Polytechnics in TAMIL NADU were visited (Appendix F). These Polytechnics were situated within travelling distance of the four Regional Centres where, as mentioned in Chapter 4, we had assembled teachers in order that they might complete our structured questionnaires. These four centres were themselves Large Government Polytechnics in four cities and of the remaining five Polytechnics, three were Private. An important consideration in the selection of these Polytechnics was that we should keep travelling time and cost to the minimum. The visits lasted altogether over approximately one month. We bore the brunt of the visiting; it was only once possible to arrange for a TTTI colleague to accompany us.

He did not participate in the research in any formal way, but he was very good at helping us to communicate verbally with Polytechnic staff and students. In each Polytechnic we arranged to observe at least one Engineering Drawing lesson from beginning to end; we also arranged to talk to the teachers of Engineering Drawing in each Polytechnic (individually or in groups) and to their leaders, depending on the opportunities offered to us in the time available.

For the classroom observations of the teachers' behaviours, we made a few notes during the lessons in the appropriate space on the RECORDING SHEET (Appendix E). An edited version of these notes together with a report of our conversations with the teachers were done in the evening of the very day of our visit to a particular Polytechnic. However, even this edited version was too long to include in the present study. Consequently, in reporting our results below, we simply refer to the Polytechnics which we visited as P.1, P.2, P.3 and so on; in this way, it was at least possible to see, for example, how frequently we observed certain aspects of the implementation of the innovation.

Although we did not want to be constrained by highly specific observation schedules and interaction schedules (Tawney, 1976), we decided nevertheless to converge on certain broad aspects of teacher behaviour and to focus our conversations on just a few broad issues related to the innovation. As the RECORDING SHEET (Q13) (Appendix E) shows, our observations were essentially centred on the extent to which teachers were actually using the new teaching strategies and devices (e.g. the completion exercises and the criterion tests). On the other hand, our conversations with the teachers aimed essentially at getting their opinions on the following matters: the usefulness of the new teaching strategies and devices and the teachers' preferences for any of these, the impact of the innovation on the learning outcomes, the organization and management of the innovation within their own institutions, the differences that they saw between the innovators' "model" of the innovation and what actually happened in practice, and the changes that they felt had taken place in their own attitudes towards the innovation as a result of FAMILIARITY with the innovation.

Our observations and conversations were neither completely "open-ended" nor completely "closed" (Jenkins, 1973). We tried to sensitize ourselves to every situation and be as perceptive and objective as possible, but very soon discovered the limitations of the researcher in these situations!

5.3.3 THE RESULTS

In order to picture certain aspects of the learning environment for Engineering Drawing in TAMIL NADU, one must imagine a very large hall, (a DRAWING HALL), capable of accommodating some 200 students and with an elevated platform in the front. The idea seemed to have been that two classes could be taught back to back at the same time! We were given to understand that the larger Polytechnics enjoyed a more favourable staff-student ratio than the smaller Polytechnics, where it approached 1:40.

The results of the FIELD STUDY tended to show that probably the main source of conflict was in the organization and management of the innovation at the institutional level. There was a gap between "product idealisation" and "product implementation" and it seems that the organisation of the innovation was breeding discontent among the teachers. Some of the difficulties were as follows: the innovative curriculum materials were not yet available in some Polytechnics (e.g. in P.1 and P.2) at the time of our visit (that is, some four weeks or so after the beginning of the academic year), time-tables had not been reorganized to allow for the change in curriculum content (P.5), the timing of the criterion tests did not match the Principal's rulings (P.9), there was not a nucleus of staff fully committed to the innovation (P.4), the more SENIOR among the staff did not actually teach the new syllabus (P.5), and the bureaucratic, administrative procedures for purchasing materials for model-making were so complex and time-consuming that they tended to become a disincentive for creative thinking (P.4).

The consequence of gross inadequacies of this kind in the management of the innovation was that they enabled the teachers to use them as a basis for rationalising their behaviours and attitudes and such rationalisations made it difficult to unravel the real ground of resistance to change in the teachers' reactions. However, on the whole the teachers welcomed the recommended innovative ideas and devices although in at least one Polytechnic (P.4) there was the feeling that the ideas underlying the new teaching techniques (e.g. Programme Learning) were already known in TAMIL NADU and that for new ideas to be implemented, it was simply a matter of a particular educational institution like TTTI taking the initiative in innovation and playing a leading role in its implementation. This feeling was to be expected. The analysis of the processes which were at work in innovations has shown that in some cases nothing happens within an educational system until a central government authority decides to adopt a new idea and issues the necessary executive orders (Westley, 1969).

There was no clear preference amongst the teachers for any one specific innovative idea or technique. However, on the whole the use of "criterion tests" and of self-instruction materials seemed to be particularly welcomed; they gave the opportunity for a continuous process of feedback and stimulated both students and teachers to greater effort. But the teachers also liked the new organization of the subject matter and were very appreciative of the clear indications that the support materials gave about the breadth and depth of treatment for each topic. They also felt that the subject matter was treated systematically and that such a treatment helped towards an understanding of Engineering Drawing.

This was not to say that criticisms were not levelled at some of the innovative ideas and devices; nor did this mean that the innovation, as it worked out in practice, fitted the "model" given by the innovators. In point of fact, teachers were critical of some aspects of the curriculum content and of some innovative ideas and techniques. Thus the teachers in one Polytechnic (P.2) criticised objective type tests on the ground that it was relatively easier to score high marks in these tests than on the traditional type of tests. The administration of "criterion tests" at frequent intervals and the marking of the tests made heavy demands on the teachers' time. Indeed, in one Polytechnic (P.6) it seemed that the students' work was not being corrected at all. There was no feedback of the students' performance and yet immediate feedback was one of the main innovative features of the NEW CURRICULUM!

Undoubtedly, a major difficulty encountered by students and reported by teachers was the one posed by LANGUAGE. The innovative materials were in English and yet it was evident (P.6, P.7, P.9) that often enough teachers had to explain the subject matter in the mother tongue in order to make the content meaningful to students. The written English of some students was incredibly poor. By way of illustration we copied word for word the note taken by one student about tangents. The definition of a tangent went in part like this: "a stright line which touch a curcle at only one point on the circule and the tangent is purfenticular to the R of the curcule". This note was not un-typical of the low standard of written English of many students. It seemed to us that it was probably not simply a matter of wrong spelling. The teachers were probably right in complaining about the low verbal ability of their students. Bernstein's (1958) argument that a "restricted code" limited the working-class child's access to universalistic meanings must surely have even greater force in this context. In spite of the language problem however, in one Polytechnic (P.3) the interesting comment was made that although to begin with students took some time in picking up the technical language, after some four months or so the students were able to learn the jargon from the NEW CURRICULUM materials more easily than in previous years; indeed, there was a marked change in learning methods compared with those of students of previous years.

The subject matter of the NEW CURRICULUM was also criticised. One of the criticisms was that there was apparently a built-in bias towards mechanical engineering (P.9). Another criticism was that the subject matter only found application in the second year of the Technicians' Course at a time when students were likely to have forgotten what they had learnt during the first year.

There was criticism too of the "CRASH COURSES" run by the innovators. In one Polytechnic (P.9) there was a frank admission that the CRASH COURSES were "not very good". The teachers wanted "long term training courses" in order to be able to use the innovative curriculum materials properly. This was an extremely valuable point for these teachers to make, specially as our statistical analyses have shown a limited association of Attendance on a CRASH COURSE with the teachers' attitudes to innovation (see Chapter 4).

We were able to catch a glimpse of the shift in attitude which had taken place in some teachers towards the innovation as a result of FAMILIARITY with the innovation. In one Polytechnic (P.5), the teachers reported that to begin with, they doubted the ability of the students to follow the NEW CURRICULUM; the support materials were difficult to understand and they felt that they had to have recourse to their own, different ways of explaining the subject matter to the students. The teachers also feared that they would not complete all the topics in the course in the allotted time. But after one year of teaching the new course, they were now confident that the students could cope with the innovative materials and that they (the teachers) could take their students through the prescribed sequence of topics "according to plan".

On the other hand, in another Polytechnic (P.9) one teacher reported that his first reactions to the NEW CURRICULUM was that the innovative materials were of greater usefulness in helping students to acquire a knowledge of Engineering Drawing than the materials of the TRADITIONAL type that he had used previously. However, later on he realised that certain topics in Engineering Drawing were not covered in the NEW

CURRICULUM. He then began to fear that the NEW CURRICULUM would probably not impart an adequate knowledge of the subject to the students. For another teacher in that same Polytechnic there was, to begin with, a feeling of uncertainty about the innovation, but later that feeling gave way to a definite concern that the NEW CURRICULUM was in fact "slightly above the standard of the students".

The remaining consideration which gave direction to the analysis of the data which we gathered during the FIELD STUDY, was the identification and clarification of the teachers' resistance to change and of their dogmatic attitudes. Pointers of resistance to change and of dogmatic attitudes were inferred from the data but the inferences could only be tentative.

Thus, we inferred resistance to change from the persistent formality of classroom management. The innovators' concept of GROUP discussion and its implementation in practice had not caught the imagination of the teachers. It seemed that only one Polytechnic (P.2) among those that we visited accepted the concept. There was in that Polytechnic a willingness to experiment with GROUP discussion but the teachers did not seem to know how to go about organising GROUP discussion when the objective was to learn specific practical skills such as those in Engineering Drawing. Actually, the Teachers' SUPPORT MATERIALS (Appendix A) made only a brief reference to GROUP discussion. They stated simply that a teacher "must spend time with students either individually or in small groups helping them overcome learning difficulties". This was seen by the innovators as an aspect of the teacher's role as "guide and counsellor" to the students. However, for those who attended a CRASH COURSE it was explained that some emphasis had also been placed on the merits of GROUP discussion as a way of learning. They were told that in the NEW CURRICULUM the innovative Engineering Drawing materials had been designed "to allow for the possibility of students working in small groups, to discuss their solutions to problems", and that students learned the relationships between different engineering subjects through informative discussions and other activities.

The absence of group discussion as a teaching strategy made us infer that on the whole the teachers were probably unhappy about structuring the classroom environment (to allow for such discussions). This apparent resistance to break from the tradition of lining up students in long arrays, in large halls for Engineering Drawing was the more unfortunate when there was evidence in at least one Polytechnic (P.5), that students felt the need for discussing their own difficulties among themselves and with the teacher. In other words, the driving force was there; if only it could be harnessed and directed to productive ends! Furthermore, the wide differences in the rates at which students progressed (e.g. P.7) seemed to provide a good reason for grouping students for discussions.

It was difficult to explain this kind of resistance to change. The teachers would probably argue that room allocations and staff-student ratios prohibited any attempt to split the classes into sub-groups. Admittedly, these were real obstacles. But for us, a partial understanding of this aspect of resistance to change came through our observation of another facet of the teachers' behaviours. It was their responses to the students' call for help with their (the students) work. We discovered an alarming lack of empathy for students; indeed on one occasion (p.9) the teacher seemed to begrudge the fact that he had to give any help at all! More commonly the help given to students was just casual and oblique (e.g.P.5). Admittedly, the teachers kept marching up and down the "Drawing Hall" and from one side to another stopping from time to time apparently to see how students were progressing. But there was an air of cold austerity. Admittedly too, the very physical structure of the Drawing Halls was not congenial to bringing students and teachers together in close contact; these Halls were more reminiscent of the large Assembly Halls of some secondary schools in England. There were of course times when teachers did allow students to come to them with their problems (e.g. P.3) and gave special, individual attention to such students and to their problems. But more often (e.g. P.5), the teachers seemed to want the students to stay stuck at their desks, as if afraid that if freedom of movement was allowed the classroom would soon degenerate into a chaotic place. It occurred to us that this persistence in keeping the formal structure of the classroom (both physical and social), might reflect the teachers' lack of confidence in their ability to maintain a disciplined pattern of learning except through external control. We saw earlier how a sense of incompetence was one of the psychological characteristics that could militate against change (Chapers 2 and 4). The teachers' reasoning seemed to be that they should not at any time allow themselves to become so involved in the problem of an individual student that the other students would then start fooling around, and that they (the teachers) would lose control of the class. This was a type of ego-defensive response. Unfortunately,the teachers did not seem to appreciate that in fact the NEW CURRICULUM through its system of continuous feedback, its industrial relevance, its self-instruction materials and its suggestions for GROUP discussions aimed ideally at avoiding those very disruptions of classroom learning that they were afraid of, whilst at the same time actually promoting learning.

But probably the most absurd teaching situation that we saw and one that reflected the teachers' resistance to change from formal to less formal teaching methods, was where the teacher placed a model of a machine component in a glass case on a table right in front of the class (P.8). The teacher drew sectional views there and then whilst the class watched in silence for some fifty minutes or so! We associated this situation with that observed in another Polytechnic (P.9) where the teaching seemed to be something of a "performance" and where the topic was chosen apparently because of its academic respectability. It seemed to us that in both these situations the teachers' presentation of themselves as competent "lecturers" was probably the overriding consideration in the teachers' minds and determined their very formal approach to teaching. However, it could well be argued that this motive was in fact activated by our presence as a visitor!

Resistance to change and its concomitant expressions of dogmatic attitudes revealed themselves in many other ways too. Thus, to say that there was nothing new in the ideas underlying the TTTI innovation (P.4) seemed to be, to some extent at least, an indication of resistance and of closemindedness. Such a denial of change implied that there was little, if any, "differentiation" (Rokeach, 1960) between the set of beliefs associated with the TRADITIONAL CURRICULUM and the set of beliefs associated with the NEW CURRICULUM. And yet, although some of the ideas in the NEW CURRICULUM might not have been altogether new for some teachers, the whole belief system implicit in the NEW CURRICULUM was quite different from the traditional one.

However, there were more specific indicants of resistance to change.

Some of these were: the dictation of notes when the innovative materials could have been duplicated (P.7), the copying of drawings from the board by students (P.5) (because, as one teacher put it, all charts could not be prepared at once), the limited construction of models (P.1; P.5) and the refusal to administer the criterion tests and mark them according to the schedule recommended by the innovators (P.9 and P.6); in short, the many substantial differences between the "model" of the innovation (as divulged by the innovators) and its implementation in practice.

The teachers could provide good reasons for their inability to adopt the recommended changes in full and these rationalizations were to some extent justified. Nevertheless, when our observations were taken in their totality, that is, when the teachers' statements and classroom behaviours were studied together and some aspects of these explained away, we were still left with an overall impression that there was rampant in the USER SYSTEM (the teachers) a slight resistance to the innovative ideas and practices which the TTTI was seeking to introduce. It was difficult to be more precise than this.

In conclusion, it must be admitted that the feedback information that we obtained from our visits was patchy; but at least it was information that was qualified by a closer familiarity with the teachers. The deficiencies of our strategy of brief and informal observations and conversations were obvious enough: our records were dependent on our own perceptual selectivity and on our memory. It could be argued that we should have sampled more lessons, used well developed techniques for the analysis of classroom interactions and tape-recorded our conversations with the teachers. However, even the more modern among the classroom interaction schedules have been criticised for focusing only on those aspects of classroom behaviour which were easily classified but which might in fact be more trivial than subtler interactions which were not readily isolated and defined but were perhaps more important educationally. In the event, we probably lost information which might have helped us to penetrate beneath the surface of the classroom events and of the teachers' reactions to the innovation. Our informal approach seemed to require the insights of the psychologist and the literary ability of the journalist! Yet, the direct impressions that we obtained had a sharpness which we were not apt at describing but were nonetheless complementary to the more objective, summarised and structured information provided by our statistical analyses. Some of the information that we lost through our faulty methodology was probably just that much "noise". However, the essence of the message that we got was clear. It was that whilst teachers in TAMIL NADU were not antagonistic to the particular curriculum innovation in their State, the conditions under which the innovation was being implemented were far from satisfactory. As a consequence, some teachers were still clinging on to their own traditional ways of imparting the skills and knowledge of Engineering Drawing to their Technician students.

We could not help wondering whether without the directives from the central office of the Directorate of Technical Education in Madras, the innovators would have obtained the co-operation of the Polytechnics; and even if they had obtained such co-operation to begin with, whether after some time the innovation would not have foundered. The indications were that it would. For it would have then been impossible to keep its momentum without a programme of regular visits by the innovators over a long period of time. But in a vast territory like

TAMIL NADU, with some Polytechnics situated hundreds of miles away from the TTTI, the organization of such visits would have been too costly and unduly time-consuming.

5.4 THE TEACHERS' ATTITUDES TO THE TRADITIONAL CURRICULUM AND TO THE NEW CURRICULUM, RESPECTIVELY

5.4.1 INTRODUCTION

The aim in this section was to determine the teachers' attitudes to the TRADITIONAL CURRICULUM and to establish whether there was conflict between these and the teachers' attitudes to the NEW CURRICULUM.

In order to obtain the teachers' attitudes to the TRADITIONAL CURRICULUM, one of the Sections of our questionnaire about the curriculum innovation in TAMIL NADU (Section Q8, Appendix E) had been so constructed that the item-statements were applicable to both the TRADITIONAL CURRICULUM materials (that is, "other existing" materials) and to the NEW CURRICULUM materials (that is, the TTTI materials). Consequently, by suitably designing this Section of the questionnaire as shown in Appendix E, the teachers in TAMIL NADU were able to give their reactions to both curricula at the same time. It was assumed that the curriculum materials reflected to some extent the different types of curriculum design and content.

The measures of attitude for this investigation were the reliable composite variables (f_3) and (f_4)(which represented the first-level factors I:V (8A) and I:V (8B) respectively, and were derived from Q8).

Figure 5.3 shows how conflict could arise from the teachers' attitudes to the NEW Curriculum and to the TRADITIONAL curriculum. Some teachers might have similar attitudes to both the TRADITIONAL CURRICULUM

FIGURE 5.3

CROSS-CLASSIFICATION OF TEACHERS' ATTITUDES TO THE NEW CURRICULUM AND TO THE TRADITIONAL CURRICULUM, RESPECTIVELY

		ATTITUDES TO THE TRADITIONAL CURRICULUM	
		POSITIVE	NEGATIVE
ATTITUDES TO THE NEW CURRICULUM	POSITIVE	a	b
	NEGATIVE	c	d

and the NEW CURRICULUM (cells a and d). Thus, some teachers might agree that both types of curricula facilitated learning (I:V (8A)), enabling students, for example, "to develop practical drafting skills" (Item 3, Q8). Those teachers could be said to have a positive attitude towards both types of curricula. Equally, some teachers might agree that both types of curricula had no motivating properties (I:V (8B)) and consequently aroused no interest in the students (Item 17, Q8). Those teachers could be said to have a negative attitude towards both types of curricula. It was assumed that those teachers who had developed a positive attitude to both types of curricula, and similarly, those who had developed a negative attitude to both types of curricula, experienced a certain degree of uncertainty and conflict about the innovation: they were probably uncertain about what precisely was the worthiness of the innovation and would probably adopt a questioning attitude towards the innovation.

Others were probably ill-disposed towards the TRADITIONAL CURRICULUM perhaps even before the introduction of the innovation and had come to like the NEW CURRICULUM (cell b) after using it. They were not uncertain about the innovation. There was no conflict in their minds about the worthiness of the innovation even if at first there was any; they perceived the NEW CURRICULUM to be good in facilitating the learning process (I:V (8A))and in motivating students to learn (I:V (8B)).

Others still, probably disagreed that the NEW CURRICULUM either facilitated learning or motivated students to learn. Indeed such teachers would even argue that it was the TRADITIONAL CURRICULUM instead that facilited learning and that motivated students to learn (Cell c). We assumed that these teachers experienced a certain degree of conflict because with the institutionalisation of the innovation they found themselves having to implement the NEW CURRICULUM and teach against their own dispositions.

In this section of the present chapter then, we tried to determine the extent to which the innovation was a source of conflict by finding out the number of teachers who could be located in the various cells on the basis of their attitudes to the TRADITIONAL CURRICULUM and to the NEW CURRICULUM, respectively. Our investigation in this section was unhypothesised.

5.4.2 THE GENERAL PROCEDURES

Respondents in TAMIL NADU were asked to consider each of the 17 statements in Section Q8 (of the questionnaire about curriculum innovation) with reference to

(a) Other existing course materials (i.e. TRADITIONAL CURRICULUM materials) and (b) The TTTI course materials (i.e. the NEW CURRICULUM materials).

The statements were presented as shown in Appendix E and respondents had to indicate the extent to which they àgreed or disagreed with the statement, on a five-point Likert scale.

The sample was (of course) the MAIN FAMILIAR SAMPLE (n=80).

THE VARIABLES

The variables of concern to us for this investigation were (f_3) and (f_4). Consequently, there were two measures of an individual teacher's response to the NEW CURRICULUM (his f_3 and f_4 factor scores) and similarly, two measures of his response to the TRADITIONAL CURRICULUM (his f_3 and f_4 scores).

5.4.3 THE ANALYTICAL PROCEDURES

It was necessary to determine the "congruence" of the factors that were obtained from the teachers' responses to the two quite different "stimulus-objects", namely, the TRADITIONAL CURRICULUM and the NEW CURRICULUM respectively, before proceeding with our analyses. Appendix M shows that the coefficient of congruence for the factors that were extracted first was 0.988 when the factors were represented by the (f_3) items; similarly, the coefficient of congruence for the second factors (when represented each by (f_4) items) was 0.817. Consequently, the teachers' responses to the set of items (f_3) and (f_4) respectively, were used as the basis of our measurements.

The internal consistency (alpha coefficient) of (f_3) for the teachers' responses about the TRADITIONAL CURRICULUM was higher (0.74) than that obtained for the teachers' responses about the NEW CURRICULUM (0.68).

On the other hand, there was a slight deterioration in the internal consistency of the items making up (f_4): the value of alpha coefficient dropped from 0.63 for the NEW CURRICULUM to 0.59 for the TRADITIONAL CURRICULUM. However, the inter-correlations of the items within (f_3) and (f_4) respectively, for the teachers' responses about the TRADITIONAL CURRICULUM were of the same order of magnitude as the inter-correlations for the responses about the NEW CURRICULUM (see Appendix M).

For each factor of attitude (f_3) and (f_4), the teachers' attitudes (as measured by their factor scores) were dichotomised about the mean score of their attitudes to the TRADITIONAL CURRICULUM (Appendix M) and categorised as positive and negative attitudes accordingly. It was then a simple matter to determine the response frequencies for the four cells in Figure 5.3. As the frequency distributions for both factors of attitudes to the TRADITIONAL CURRICULUM were reasonably symmetrical, the means were preferred to the medians (Guilford, 1973).

5.4.4 THE RESULTS

The results are presented in the following order:

<u>5.4.4.1</u> The RESULTS for (f_3) specifically

<u>5.4.4.2</u> The RESULTS for (f_4) specifically

5.4.4.1 THE RESULTS FOR (f_3) SPECIFICALLY (ANALYSIS OF THE RESPONSE FREQUENCIES (SEE FIGURE 5.3))

Table 5.4 shows that the vast majority of the teachers (92.5%) supported the idea that the NEW CURRICULUM facilitated classroom learning (f_3). On the other hand, exactly half their number (46.25%) also supported the idea that the TRADITIONAL CURRICULUM facilitated

TABLE 5.4

CROSS-CLASSIFICATION OF TEACHERS' ATTITUDES TO THE TRADITIONAL CURRICULUM AND TO THE NEW CURRICULUM, RESPECTIVELY

		Attitudes to the TRADITIONAL CURRICULUM		
		% teachers with Positive attitudes	% teachers with Negative attitudes	
Attitudes to the NEW CURRICULUM	% teachers with Positive attitudes	46.25 (37)	46.25 (37)	92.5 (74)
	% teachers with Negative attitudes	6.25 (5)	1.25 (1)	7.5 (6)
		52.5 (42)	47.5 (38)	100 (80)

(NOTE: a) actual frequencies are shown in brackets
b) the teachers' attitudes were dichotomised about the mean for the TRADITIONAL CURRICULUM and categorised as positive and negative, see Appendix M).

classroom learning. Consequently in terms of our argument above in section 5.4.1, those 37 teachers who made up the 46.25% probably experienced some conflict and uncertainty about the innovation. On the other hand, the other 37 teachers who supported the idea that the NEW CURRICULUM facilitated learning but were against the idea that the TRADITIONAL CURRICULUM facilitated learning probably welcomed the innovation with little uncertainty.

Those who were most likely to find teaching a stress under the conditions laid down by the NEW CURRICULUM, were the five teachers

(6.25%) who perceived the TRADITIONAL CURRICULUM as a greater facilitator of learning than the NEW CURRICULUM. Those teachers probably experienced intense conflict.

5.4.4.2 THE RESULTS FOR (f_4) SPECIFICALLY

A study of Table 5.5 shows that a substantial majority of the teachers (73.75%) agreed that the NEW CURRICULUM motivated students to study.

TABLE 5.5

CROSS-CLASSIFICATION OF THE TEACHERS' ATTITUDES TO THE TRADITIONAL CURRICULUM AND TO THE NEW CURRICULUM, RESPECTIVELY

		Attitudes to the TRADITIONAL CURRICULUM		
		% Teachers with Positive Attitudes	% Teachers with Negative Attitudes	
Attitudes to the NEW CURRICULUM	% Teachers with Positive Attitudes	31.25 (25)	42.5 (34)	73.75 (59)
	% Teachers with Negative Attitudes	10 (8)	16.25 (13)	26.25 (21)
		41.25 (33)	58.75 (47)	100 (80)

(NOTE: a) Actual frequencies are shown in brackets

b) The teachers' attitudes were dichotomised about the mean for the TRADITIONAL CURRICULUM and categorised as positive or negative; see Appendix M).

Yet, a little less than half of those teachers i.e. 25 teachers, also agreed that the TRADITIONAL CURRICULUM motivated students to study. Consequently this latter group of teachers probably experienced uncertainty to a small extent. However, for the teachers who supported the NEW CURRICULUM but opposed the TRADITIONAL CURRICULUM (that is, the 42.5%), there was probably no uncertainty about the innovation.

Thirteen teachers (16.25%) opposed the idea that the NEW CURRICULUM motivated students to learn but equally they opposed the same idea in relation to the TRADITIONAL CURRICULUM. These teachers probably experienced uncertainty about the innovation. But the teachers for whom the innovation in all likelihood occasioned intense conflict were those eight (i.e. 10 per cent) who thought that the TRADITIONAL CURRICULUM motivated students to learn and that the NEW CURRICULUM did not.

5.4.5 THE ANALYSIS OF RESULTS

The results showed that for a total of approximately 54% of the teachers there was a feeling of uncertainty about the idea that the NEW CURRICULUM facilitated learning (f_3) (cells a, c, d in Figure 5.3). Following the same reasoning, for approximately 58% of the teachers, there was probably uncertainty about the idea that the NEW CURRICULUM motivated students to learn (f_4).

Actually, when the teachers' responses to the TRADITIONAL CURRICULUM and to the NEW CURRICULUM were examined for both dimensions of attitude (f_3) and (f_4) <u>taken together</u>, it was found that about 72.5% of the teachers probably experienced a feeling of uncertainty in varying degrees. Only 22 teachers (i.e. 27.5%) had no uncertainty about the NEW CURRICULUM because they had a <u>positive</u> attitude towards the NEW CURRICULUM (cell b) for <u>both</u> of these two factors of attitude (Appendix M). On the other hand, two teachers (i.e. 2.5%) probably found the innovation something of an excruciating experience; they had a positive attitude to the TRADITIONAL CURRICULUM and a negative attitude to the NEW CURRICULUM for <u>both</u> first-level factors of attitude (f_3) and (f_4) (cell c). These two were untrained JUNIOR TEACHERS with LESS THAN 10 years Teaching Experience; they had an Average level of Dogmatism and came from large, Government Polytechnics. They had NOT ATTENDED a CRASH COURSE. They were probably angry young men who rejected tradition but who at the same time probably felt that the NEW CURRICULUM was still not right to their way of thinking; it still did not fit in with their vision of an Engineering Drawing curriculum for young technician students.

A possible cause of uncertainty amongst many teachers was that for the TRADITIONAL CURRICULUM there were no clear-cut, well-defined <u>State policies</u> concerning learning procedures and classroom practices. Consequently, although there were a few standard practices there was probably a degree of randomness, not to say casualness, in the teachers' overall strategies to learning. Such randomness was reflected in the varying approaches of different Polytechnics to Internal assessments. It contrasted sharply with the carefully thought out teaching strategy which was implicit in the TTTI innovation and which was reflected in an abundance of specific guide-lines about teacher classroom behaviours, students' learning activities and assessment procedures.

To summarise then, the three investigations reported in this chapter painted for us a fairly vivid picture of the innovation as it happened in practice. They also confirmed to some extent the presuppositions concerning uncertainty and resistance to change which were elaborated in Chapter 2.

CHAPTER 6

The PROCEDURES and RESULTS for the study of the correlates of the teachers' attitudes to curriculum innovation in England (STAGE B, PART III).

6.1 INTRODUCTION

The present chapter gives the report of the procedures and results for our research at STAGE B, that is, in England. As already indicated, there were two aspects to this research: firstly, we attempted to replicate the findings in India and secondly, we extended our study to include forms of RESISTANCE-within-PERSONALITY other than Dogmatism in our Multiple Correlation Analyses. For ease of reference, the first aspect will sometimes be designated as the Replication Study and the second aspect as the Extension Study.

The rationale for the Replication Study and for the Extension Study was given in Chapter 3 and the similarities between the curriculum innovation in Engineering Drawing (in India) and that in Mathematics (in England) are explained in Appendix B.

The analytical procedures used in the present chapter were straightforward enough consisting mainly of the procedures usually associated with factor analysis and correlational analysis and already discussed in Chapter 3.

6.2 STATEMENTS OF THE SUB-HYPOTHESES

On the basis of our discussions in Chapters 2 and 3, five sub-hypotheses were stated in the present chapter; all of them were concerned with relationships involving second-level factors of attitudes to curriculum innovation in our sample of Secondary School Teachers of Mathematics in England (designated as the ENGLISH SAMPLE). As explained in Chapter 3 (see Figure 3.2) there were on the one hand the two second-level factors which were represented by the same sets of items as in India and denoted as EF'_A and EF'_B; on the other hand, there were the two second-level factors which were derived in the ENGLISH SAMPLE itself from the intercorrelations of the first level factors and which were denoted as EF_A and EF_B.

Sub-Hypothesis (IV)

The second-level factors of attitude EF_A and EF_B respectively will be "congruent" with the corresponding second-level factors of attitude (F_A and F_B respectively) extracted from the teachers' responses in the Indian MAIN FAMILIAR SAMPLE.

Sub-Hypothesis (V)

The teachers' attitudes to curriculum innovation (as measured by their scores for each of the variables representing the second-level factors of attitude to the curriculum innovation, that is, the variables EF_A' and EF_B') will correlate significantly and negatively with their Dogmatism scores (as measured by Rokeach's Dogmatism Scale E).

Sub-Hypothesis (VI)

The teachers' scores for each of the variables EF_A' and EF_B' respectively, will correlate significantly and negatively with their scores for Neuroticism (as measured by the Eysenck Personality Inventory), and for Rigidity (as measured by Gough's Scale), respectively.

Sub-Hypothesis (VII)

The teachers' scores for each of the variables EF_A' and EF_B' respectively, will not correlate significantly with their scores for Extraversion (as measured by the Eysenck Personality Inventory).

Sub-Hypothesis (VIII)

The teachers' scores for each of the variables EF'_A and EF'_B respectively, will correlate significantly and negatively with their scores for the RESISTIVITY FACTORS which were derived as explained below (Section 6.3.3.1) and on which Dogmatism, Rigidity and Neuroticism had high loadings.

As explained in Chapter 2, it was expected that the derived RESISTIVITY FACTORS would be anchored to the two basic PERSONALITY dimensions, Neuroticism and Extraversion. Since it was also expected that Extraversion would not correlate with the teachers' attitudes to curriculum innovation, it followed that the RESISTIVITY FACTOR which was anchored to Extraversion would explain only a small proportion of the variance in the teachers' attitudes to curriculum innovation.

6.3 THE GENERAL PROCEDURES

6.3.1 THE SAMPLING PROCEDURES AND THE DATA-COLLECTION PROCEDURES IN ENGLAND

The population to which we wanted access was that of Secondary School Mathematics teachers involved in the one particular curriculum innovation in Mathematics to which we referred in Chapter 3. To obtain a probability sample from that population required an enumeration of the "units" (the teachers) in the population. But this population was a changing one; it was to be expected that the innovation would go on diffusing through the schools and that the population of Mathematics teachers involved in that particular curriculum innovation would increase. Consequently, the representativeness of the population of Secondary School Teachers of Mathematics that might ultimately adopt the innovation could not be ensured.

However, assuming that it was possible to make a complete count of all teachers involved in the innovation <u>at the time</u> of the research, we could have obtained a probability sample of the population <u>at the time</u> by using standard stratified sampling procedures. We could then have <u>either</u> assembled together teachers in selected schools and administered the questionnaires in person <u>or</u> mailed the questionnaires to these teachers. But our experience of mailing questionnaires to teachers in the states of Mysore, Kerala and Andhra Pradesh in South India had not been an encouraging one (see Chapter 4). Indeed, we could expect an even lower response rate for the Replication Study because of the additional PERSONALITY tests that were to be included in the battery of questionnaires (Appendix E). To say that teachers were in general "very strongly resistant to questionnaires of all kinds" (Pearce, 1973) was probably too broad a generalization, but it could not be taken for granted that teachers were anxious to devote a considerable amount of time in completing our questionnaires and to return them by post. Moreover, it seemed necessary when researching into the attitudes of teachers to invite their co-operation in person. The fostering of such a spirit of co-operation was not easy if teachers were given the idea that they were somehow under test (Steadman, 1976). In order to avoid giving this impression it required of us to meet teachers and reassure them that this was not the case. We needed too to give them some idea of what we were hoping to achieve through our questionnaires. For these reasons then, the mailing of the questionnaires to the teachers was ruled out.

On the other hand, since our research in England did not have the official support of any educational body, it was not possible to assemble teachers at a number of centres as we did in India. Nor did we feel we could approach teachers through the schools because we would have had to explain to Headmasters the purpose of the questionnaires and specially the use of the personality tests. Headmasters would in all likelihood be unwilling to co-operate with us for fear of spoiling their relationships with the innovators and with the officers of the local education authorities. In addition, we judged that the cost in time and money for obtaining a probability sample in this way did not justify the means. Yet, we wanted a sample of teachers that was heterogeneous in terms of BACKGROUND INFORMATION variables, such as Teaching Experience, Type of Secondary School (e.g. Comprehensive/Public) and Geographical area. It seemed that there was left to us only one possible access to the population of teachers involved in the innovation; this was the access through a group of teachers who were attending one of the yearly conferences or COURSES run by the organizers of the innovation with the aim of discussing the new ideas embodied in the innovation with teachers. Fortuitous or "haphazard" samples obtained in this fashion formed "the bases of most research in many fields" (Kish, 1965) and were in the present circumstances very convenient. Such "accidental sampling", as Kerlinger (1973) has remarked, was "not as bad" as it had been said to be, but "extreme circumspection" had to be used in the interpretation of the results. Thus, it could be argued that a sample of teachers obtained in this way was likely to be biased because the teachers who attended the Course were strongly motivated to internalize the values embodied in the innovation. On the other hand, ATTENDANCE on a COURSE could be put to advantage in the present Replication Study because we could investigate the relationship between FAMILIARITY and teachers' attitudes to curriculum innovation in England, with the variance due to ATTENDANCE on a COURSE controlled.

Thus it was that all the 128 Secondary School Teachers of Mathematics who attended the conference (about the innovation in Mathematics, Appendix B) at the particular centre where we were conducting our investigation were invited to assemble in the lecture theatre at that centre in order to complete our structured questionnaires (Appendix E). In all, 124 teachers accepted our invitation. However, the actual sample that was used subsequently for the data analysis was much smaller. The considerable attrition in sample size was due firstly to a change of mind among 23 of the teachers <u>after</u> we had explained to them the purpose of the questionnaires and the type of information that was being sought. Those 23 teachers expressed their reservations about the usefulness and validity of personality questionnaires. This reaction was to be expected and to some extent vindicated our method of collecting the teachers' responses by meeting the teachers in person; mailing the questionnaires would have yielded a low response rate. It seemed that these twenty-three teachers would have had no objection to taking part in the research if it was only a matter of expressing their opinions about the curriculum innovation itself.

But as Table 6.1 and Appendix N show, the size of the sample was reduced even further. Of the 101 questionnaires that were finally completed, 4 had a number of items left blank and another 7 were later rejected because of the respondents' high scores (> 5) on the LIE scale in the Eysenck's Personality Inventory which was used in the Extension Study. There was a further reduction still in the sample size due to 8 questionnaires which had no responses for AGE in spite of our checks when the respondents returned their completed questionnaires. Hence, for the Multiple Correlation Analyses, the sample size was reduced to 82; however, because AGE was not a variable which entered into the second-level factor analysis for deriving the factors of attitudes to curriculum innovation, the sample size for that factor analysis was 90. Kerlinger (1973) has recommended using "as large samples as possible" for factor analysis because the reliable identification of factors, required large samples "to wash out" error variance.

TABLE 6.1

THE ENGLISH SAMPLE OF SECONDARY SCHOOL TEACHERS OF MATHEMATICS
(see also Appendices B and N)

	Sample Size
Men Teachers	54
Women Teachers	28
TOTAL	82

Of the eight teachers who left AGE out but whose other responses were used for the factor analysis, five were women teachers and three men teachers.

Since we had agreed with the teachers that they would remain anonymous, it was not possible to determine how representative the sample was of schools in different geographical regions. However, the composition of the total course membership by geographical area showed that the teachers came from a number of regions (Appendix B). About 84% of the teachers who attended the Conference came from the North of England and about 64% of these were from Yorkshire and Humberside, bringing the overall percentage of teachers from that region to 54%.

6.3.2 THE QUESTIONNAIRES AND THE VARIABLES

Appendix E tabulates the set of questionnaires that the teachers were asked to complete. The questionnaires were about the teachers'

(a) Background,

(b) Knowledge of the innovation in Mathematics (i.e. degree of FAMILIARITY with the innovation),

(c) Experience of Bureaucracy,

(d) Dogmatism, Rigidity, Neuroticism, Extraversion,

(e) Attitudes to the curriculum innovation in Mathematics.

Appendix (E) shows quite explicitly how the questionnaires were related to those used in the Indian Study.

The questionnaires were structured in the same way as in India and the response categories were kept the same as far as possible. However, the teachers in England had fewer items about the curriculum innovation to respond to. This is because the pool of items that was used originally in India was reduced as a result of developing our attitude scales and of retaining only the salient variables from the first-level factor analysis.

As already indicated, for the purpose of the Extension Study two additional PERSONALITY tests were also included. These tests were the Eysenck Personality Inventory (Eysenck and Eysenck, 1971) for the measurement of Neuroticism and of Extraversion, and Gough's (1960) Rigidity Scale (see Appendix E). Form A of the Eysenck Personality Inventory was used but there was no reason for preferring it to Form B because the split-half reliability between the two Forms of the Inventory ran from approximately 0.85 to 0.95. Appendix (E) gives details of the confusion surrounding the item content of the Gough's Rigidity scale. However, we were of the opinion that because our research was tied up with Rokeach's Dogmatism Scale, we should use his own version of the scale as given in his book "The Open and Closed Mind" (Rokeach, 1960). This was also the opinion of the Consulting Psychologists Press as expressed to us in a private correspondence. In practice, Rokeach's Dogmatism Scale E, Gough's Rigidity Scale and the Eysenck Personality Inventory were all attached to the questionnaire about the curriculum innovation in Mathematics so that the teachers could complete all the questionnaires at the same time.

<u>The Variables</u>

Figure 6.1 shows all the variables that were included in the many Correlation Analyses reported below in this chapter (Section 6.3.3)

SEX was added to the list of BACKGROUND INFORMATION variables studied in India because the teaching of Mathematics in England was not the prerogative of men only! AGE and ACADEMIC QUALIFICATION had not been included in India because of the assumption that these were closely associated with PRESENT POSITION and TEACHING EXPERIENCE

FIGURE 6.1

THE VARIABLES FOR THE MULTIPLE AND SIMPLE CORRELATION ANALYSES IN THE ENGLISH SAMPLE (n = 82)

The Independent Variables	Background Information Variables	SEX ACADEMIC QUALIFICATION TEACHING EXPERIENCE PROFESSIONAL TRAINING TYPE OF SCHOOL AGE
	Knowledge of Innovation Variable	FAMILIARITY
	The Organization Variable	Experience of Bureaucracy
	PERSONALITY Variables	Dogmatism Rigidity Neuroticism Extraversion The derived RESISTIVITY FACTORS
The Dependent Variables	The second-level factors of attitudes to curriculum innovation (EF'_A and EF'_B)	

in a centrally controlled educational system. But this assumption was probably not valid in England. As for ACADEMIC QUALIFICATION, Lin (1966a) has reported a significant correlation between teachers' "educational level" and "internalization of innovation". On the other hand, the complexities of the Secondary Education system in England were such that it was decided to leave out two variables that were included in the original study (PRESENT POSITION and SIZE OF SCHOOL) because of the difficulty that we would have had to give interpretations to the findings.

The FAMILIARITY variable could only take three values because it could only be categorised as "Quite Unfamiliar", "Quite Familiar" and "Very Familiar"; there were no teachers in the "Very Unfamiliar" category since all the teachers in the sample were attending a course which was organized by the innovators and which focused on the innovation.

As the results show below in Section 6.4, two RESISTIVITY FACTORS were identified and were labelled:

1. The Emotionality - RESISTIVITY factor (RF_1).
2. The Conditionability - RESISTIVITY factor (RF_2).

6.3.3 THE ANALYTICAL PROCEDURES

6.3.3.1 THE FIRST-ORDER FACTOR ANALYSIS OF THE INTERCORRELATIONS BETWEEN THE PERSONALITY VARIABLES

The intercorrelations between the four PERSONALITY variables (that is between Dogmatism, Rigidity, Neuroticism and Extraversion) were factor-analysed. The procedures for this factor analysis were exactly the same as those described for the Varimax analyses in Chapter 4.

6.3.3.2 THE SECOND-LEVEL FACTOR ANALYSIS OF THE TEACHERS' RESPONSES TO CURRICULUM INNOVATION

The procedures for the extraction of the second-level factors EF_A and EF_B were the same as those used in India (see Chapter 4); that is, a Principal Components Analysis of the intercorrelations of the first-level factors (based on the teachers' scores in the ENGLISH SAMPLE) was done first and this was followed by a Varimax rotation.

6.3.3.3 THE ZERO-ORDER CORRELATION ANALYSES

The same procedures as those described in Chapter 4 were again adopted for calculating the simple correlations between each second-level factor of attitude to curriculum innovation (EF_A' and EF_B') and each of the independent variables.

The PERSONALITY variables, the Organization variable (Experience of Bureaucracy), and AGE were all continuous variables; product-moment correlation coefficients were therefore calculated for them. The scoring procedure for Dogmatism was explained above in Chapter 4 whilst the scoring procedures for Rigidity, Neuroticism and Extraversion respectively are explained in Appendix E. The factor scores for the two RESISTIVITY FACTORS were obtained by the "complete method" as part of the computer output statistics from the factor analysis (see Section 6.3.3.1 above).

The other "independent" variables were categorical variables; they were genuine dichotomies except for TEACHING EXPERIENCE and FAMILIARITY which were artificially dichotomised. For all dichotomies, respondents were given a score of 1 or 2 for each response category as before. For TEACHING EXPERIENCE the point-biserial r was converted to a biserial r as in Chapter

4 and the dichotomy was the same as in India (Less than/More than 10 years). For FAMILIARITY, we could have done as in India, that is, we could have dichotomised the variable as "Quite Familiar" and "Very Familiar". But that would have meant that the data for a few respondents (see Table 6.2) would have had to be rejected because they were "Quite Unfamiliar" with the innovation. Instead, we dichotomised the variable as "Quite Unfamiliar" and "Familiar" and made the necessary correction for the biserial r. However, it was also possible to examine the relationships between FAMILIARITY and the attitude factors using the product-moment correlation coefficient if we assumed that the intervals between "Quite Unfamiliar", "Quite Familiar" and "Very Familiar" were equal. We made this assumption and did this analysis as well.

Figure 6.2 shows the techniques that were used for obtaining the zero-order correlations; details of these techniques were the same as those described in Chapter 4.

6.3.3.4 THE MULTIPLE CORRELATION ANALYSES

As with the Indian data, these analyses were done by using the IBM Computer program for a stepwise linear regression analysis with the attitude factors as "dependent" variables one at a time and with the PERSONALITY variables, Experience of Bureau-cracy and the Background Information variables, as "independent" variables. The semi-partial correlations were obtained as part of the output statistics and hence the contribution of a particular independent variable to the variance of each attitude factor could be calculated.

FIGURE 6.2

THE CORRELATION TECHNIQUES USED FOR COMPUTING THE ZERO-ORDER CORRELATIONS BETWEEN THE INDEPENDENT VARIABLES AND THE SECOND-LEVEL FACTORS OF ATTITUDES TO CURRICULUM INNOVATION

Characteristic of the independent variables	The Independent Variables	The Correlation Techniques
Continuous	Age	Pearson product-moment (r)
	Dogmatism	Pearson product-moment (r)
	Experience of Bureaucracy	Pearson product-moment (r)
Categorical	Sex (Male/Female)	Point-biserial (r_{pb})
	Academic Qualification (Graduate/Non-Graduate)	Point-biserial (r_{pb})
	Professional Training (Trained/Untrained)	Point-biserial (r_{pb})
	Teaching Experience (LESS THAN/MORE THAN 10 years)	Biserial (r_b)
	Type of School (State/Private)	Point-biserial (r_{pb})
	FAMILIARITY (Quite Unfamiliar/Familiar)	Biserial (r_b)

Note: (a) For the categorical variables, the scoring was 1 for the first alternative and 2 for the second alternative.

(b) The second-level factors of attitude were continuous variables.

Four Multiple Correlation Analyses were done. Figure 6.3 shows the distinguishing features of these analyses.

The Multiple Correlation Analyses (IV) and (V)

The feature of these two analyses which set them apart from the other two analyses ((VI) and (VII)) was that only Dogmatism was included as a PERSONALITY variable in the explanatory schemes for the first two. The point was that analyses (IV) and (V) were simply aimed at replicating the Multiple Correlation Analyses (I) and (II) that were done in the MAIN FAMILIAR SAMPLE in India.

FIGURE 6.3

THE DISTINGUISHING FEATURES OF THE MULTIPLE CORRELATION ANALYSES (MCA) IN THE ENGLISH SAMPLE

		The Dependent Variables	
		EF'_A	EF'_B
The Independent PERSONALITY Variables	Only Dogmatism	MCA (IV)	MCA (V)
	Only the RESISTIVITY FACTORS (RF_1 and RF_2)	MCA (VI)	MCA (VII)

Note: (a) The other independent variables listed in Figure 6.1 were the same for all the analyses.

(b) The Multiple Correlation Analyses (I), (II) and (III) were described in Chapter 4.

The Multiple Correlation Analyses (VI) and (VII)

In these analyses the explanatory framework included the RESISTIVITY FACTORS, RF_1 and RF_2, as the PERSONALITY variables. Dogmatism was excluded because its loading on RF_1 was high (-0.857, see Table 6.10

below) and the correlation between these two variables was, therefore, substantial. For the same reason Rigidity and Neuroticism were also excluded.

6.3.3.5 THE FIRST-ORDER PARTIAL CORRELATION ANALYSES

As in India, for each second-level factor of attitude (EF'_A, EF'_B), we also studied the effect of partialling out Dogmatism only on the zero-order correlation of the factor with Experience of Bureaucracy. The aim was again to derive in a very simple way, a causal model that explained the relationships between these variables in the ENGLISH SAMPLE.

6.4 THE RESULTS

For the sake of clarity, the results that were relevant to the Replication Study were presented first; these were followed by the results which were relevant to the Extension Study. Furthermore, for the replication of the findings, whenever comparisons between the MAIN FAMILIAR SAMPLE in India and the ENGLISH SAMPLE were useful, the results for both samples were tabulated together in order to facilitate such comparisons.

The results are presented in the following order:

6.4.1 THE RESULTS FOR THE REPLICATION STUDY

6.4.1.1 The SUMMARY DATA for the independent variables (i.e. the Background Information variables, the KNOWLEDGE of innovation variable (FAMILIARITY), Experience of Bureaucracy and Dogmatism).

6.4.1.2 The Results of the Second-level FACTOR ANALYSIS of the intercorrelations between the composite variables which represented the first-level factors.

6.4.1.3 The Results of the CORRELATION ANALYSES for the Replication of the findings in India.

6.4.2 THE RESULTS FOR THE EXTENSION STUDY

6.4.2.1 The SUMMARY DATA for the personality variables Rigidity, Neuroticism and Extraversion.

6.4.2.2 The Results of the first-order FACTOR ANALYSIS of the intercorrelations of the personality variables (Dogmatism, Rigidity, Neuroticism, Extraversion).

6.4.2.3 The Results of the CORRELATION ANALYSES for the Extension Study.

6.4.1 THE RESULTS FOR THE REPLICATION STUDY

6.4.1.1 THE SUMMARY DATA FOR THE INDEPENDENT VARIABLES

The schoolteachers' responses to questions about their Backgrounds (Q15) and to the questionnaires on Experience of Bureaucracy (Q19) and Dogmatism (Q20) are summarised in Tables 6.2 and 6.3 below.

Table 6.3 shows that there were large differences between the two samples of teachers (the ENGLISH SAMPLE and the MAIN FAMILIAR SAMPLE) in their levels of Dogmatism and in their Experience of Bureaucracy. No hypothesis had been explicitly stated concerning these differences but a post hoc comparison of the mean scores showed that the differences were highly significant ('t' = 11.918, $P < .001$ for Dogmatism and 't' = 9.232, $P < .001$ for Experience of Bureaucracy).

TABLE 6.2

RESPONSE FREQUENCIES FOR THE BACKGROUND INFORMATION VARIABLES AND FOR THE KNOWLEDGE OF CURRICULUM INNOVATION VARIABLES (BY SAMPLE)

Background Information Variables and KNOWLEDGE of curriculum innovation variables	Categories of Responses	Response Frequencies (%)	
		ENGLISH SAMPLE (n = 82)	MAIN FAMILIAR Indian Sample (n = 80)
Sex	Male	65.85 (54)	100 (80)
	Female	34.15 (28)	- (0)
Professional Training	Yes (Trained)	65.85 (54)	16.25 (13)
	No (Untrained)	34.15 (28)	83.75 (67)
Teaching Experience	Less than five years	56.1 (46)	15 (12)
	Five to ten years	18.3 (15)	55 (44)
	More than ten years	25.6 (21)	30 (24)
FAMILIARITY with the innovation	Quite Unfamiliar	12.2 (10)	- (0)
	Quite Familiar	69.5 (57)	53.75 (43)
	Very Familiar	18.3 (15)	46.25 (37)
Attendance on Course	Yes	100 (82)	30 (24)
	No	- (0)	70 (56)
Type of School/ Polytechnic	Government or State	85.4 (70)	40 (32)
	Private or Independent	14.6 (12)	60 (48)

Note: (a) The numbers in brackets were the actual response frequencies.

(b) See Appendix (N) for the Background Information variables omitted here.

The distribution of scores for Experience of Bureaucracy was positively skewed whilst the distribution of the Dogmatism scores came very close to being symmetrical (Appendix N).

The average age of the schoolteachers was 31yrs (S.D. = 9.62) and about 55 per cent among them were graduates.

TABLE 6.3

MEANS AND STANDARD DEVIATIONS OF SCORES FOR DOGMATISM AND FOR EXPERIENCE OF BUREAUCRACY (BY SAMPLE)

SAMPLES	Variables					
	Dogmatism			Experience of Bureaucracy		
	n	M	SD	n	M	SD
ENGLISH SAMPLE	82	143.07	29.433	82	35.01	9.20
MAIN FAMILIAR SAMPLE (India)	80	194.6	25.504	80	43.05	7.86

Note: (a) (Minimum possible score for Dogmatism = 40
Maximum possible score for Dogmatism = 280)

(b) (Minimum possible score for Experience of Bureaucracy = 14
Maximum possible score for Experience of Bureaucracy = 70)

6.4.1.2 THE RESULTS OF THE SECOND-LEVEL FACTOR ANALYSIS

As explained above the sample size for the second-level factor analysis was 90 (not 82).

Two second-level factors with latent roots greater than 1 were extracted (see Appendix N) and rotated. Table 6.4 gives the results of the Varimax Rotation. Together, the two factors accounted for 53 per cent of the total variance in the ENGLISH SAMPLE compared with 46 per cent in the MAIN FAMILIAR SAMPLE in India. The similarity between the factor structures in the two respective samples was of a high order. The coefficients of congruence (see Appendix N) for the first factors (EF_A and F_A) and for the second factors (EF_B and F_B) were both high ($\emptyset$ = .946 and .820, respectively). Thus, the results gave support to Sub-Hypothesis IV.

However, turning from resemblances to differences, the second-level factors that were extracted in England were not characterized by exactly the same variables as in India. Thus, unlike what was found in India (Chapter 4), the "belief that the new curriculum materials facilitated the teaching-learning process through their practical relevance and through the individualisation of learning" (f_3), was associated in the minds of the teachers with their "support for the design, content and teaching requirements of the new curriculum" (EF_A). Another difference was that support for changing the syllabus (f_2) was associated with a belief in the professional competence of teachers to engage in curriculum innovation (EF_B).

The variables f_4, f_7 and f_8 (Table 6.5) constituted quite clearly an "identity set" (see Chapter 3) and this demonstrated identity enabled us to claim equivalence for the corresponding measures of attitudes (F_A') and (EF_A') used in India and in England respectively.

TABLE 6.4

VARIMAX ANALYSIS OF THE COMPOSITE VARIABLES WHICH CHARACTERIZED THE FIRST-LEVEL FACTORS OF ATTITUDE TO CURRICULUM INNOVATION (FOR THE ENGLISH SAMPLE (n = 90))

The Composite Variables	Rotated second-level factor loadings		Communality (h^2)
	I	II	(%)
f_1	-.088	.616	38.7
f_2	.093	-.495	25.4
f_3	-.799	-.255	70.5
f_4	-.729	.186	56.6
f_7	-.829	-.074	69.3
f_8	-.763	.238	63.9
f_9	-.171	-.683	49.6
Percentage Variance	35.5	17.9	

(Note: Factor I was designated as EF_A in the text and Factor II as EF_B.)

TABLE 6.5

THE INTER-CORRELATIONS OF THE INDICATORS OF "SUPPORT FOR THE DESIGN, CONTENT AND TEACHING REQUIREMENTS OF THE NEW CURRICULUM" (EF'_A IN ENGLAND AND F'_A IN INDIA)

IN ENGLAND

($\bar{r}$ = .471)

	f_4	f_7	f_8
f_4	-		
f_7	.429	-	
f_8	.489	.494	-

IN INDIA

($\bar{r}$ = .394)

	f_4	f_7	f_8
f_4	-		
f_7	.262	-	
f_8	.482	.439	-

($\bar{r}$ = average correlation)

On the other hand, the correlation between (f_1) and (f_9), (the composite variables which represented factor EF'_B) was much reduced in the ENGLISH SAMPLE (see Appendix N).

The frequency distributions of the factor scores for EF'_A and EF'_B respectively were almost symmetrical (Appendix N). It was therefore possible to proceed with the intended correlational analyses.

As the scores for EF'_A and EF'_B were obtained from the standardised scores of the constituent composite variables (appropriately weighted), their means were zero. The standard deviations were 1.8527 and 1.080, respectively.

6.4.1.3 THE RESULTS OF THE CORRELATION ANALYSES FOR THE REPLICATION STUDY

The results of the zero-order correlation analyses

Table 6.6 shows that Dogmatism correlated significantly and negatively with the teachers' support for the design and content of the NEW CURRICULUM (EF_A') ($r = -.232$, $P < .05$). No other independent variable in the study was associated with (EF_A').

EF_B' was associated with Dogmatism ($r = -.322$, $P < .01$) and with AGE ($r = -.221$, $P < .05$). The correlation of EF_B' with FAMILIARITY ($r = .205$), although only of border-line significance, was interesting because EF_B' was partly composed of the first-level factor (f_1) which we had found in India to correlate significantly ($r = .258$, $P < .01$, $n = 134$) with FAMILIARITY. However, in India, the FAMILIARITY variable was dichotomised rather differently, that is, as NON-FAMILIAR/FAMILIAR (see Chapter 4). But when we made the assumption that the FAMILIARITY scale approximated interval equality for the categories used in England and looked upon it as a continuous scale, we found that the simple correlation between FAMILIARITY and EF_B' was then significant at the five per cent level ($r = 0.227$, $P_{.05} = .217$, $df = 80$). The interpretation of this associative trend in the ENGLISH SAMPLE was that there was probably a slight tendency for attitudes towards the style or "form" of management of curriculum innovation to become more polarised with increasing familiarisation with curriculum innovation.

The results of the Multiple Correlation Analyses (IV) and (V)

A summary of the results of the Stepwise Regression Analyses giving the Multiple and semi-partial correlations was reproduced

TABLE 6.6

THE ZERO-ORDER CORRELATIONS IN THE ENGLISH SAMPLE (n = 82) BETWEEN THE SECOND-LEVEL FACTORS OF ATTITUDE TO CURRICULUM INNOVATION AND THE "INDEPENDENT" VARIABLES

"Independent" Variables		The Zero-Order Correlations For EF'_A	The Zero-Order Correlations For EF'_B
Background Information Variables	Age	.012	-.221*
	Sex (Male/Female)	-.154	-.011
	Academic Qualification (Graduate/Non-Graduate)	.030	.028
	Professional Training (Trained/Untrained)	-.012	.083
	Teaching Experience (LESS THAN/MORE THAN 10 years)	-.168	-.061
	Type of School (State/Private)	.156	-.158
Knowledge of Curriculum Innovation Variable	FAMILIARITY (Quite Unfamiliar/Familiar)	-.065	.205
Organization Variable	Experience of Bureaucracy	-.154	-.184
Personality Variable	Dogmatism	-.232*	-.322**

* Significant at the five per cent level
** Significant at the one per cent level
($P_{.05}$ = .217, for df = 80; $P_{.01}$ = .283, for df = 80)

Note: (a) EF'_A = Support for the design, content and teaching requirements of the new curriculum (the direction for scoring the factor was reversed here (see Chapter 4).

EF'_B = Belief in the professional competence of teachers for initiating and implementing curriculum innovation.

(b) For the categorical variables, the scoring was 1 for the first alternative and 2 for the second alternative.

(c) The correlations given here for Teaching Experience and FAMILIARITY (the artificial dichotomies) were obtained after correction.

in Appendix N. Table 6.7 shows that for both second-level factors of attitude to curriculum innovation, their correlations with Dogmatism were significant; indeed, they were the only significant ones. Sub-hypothesis (V) was therefore supported. The regression analysis was stopped after STEP 1 because no more variables were found to improve the "goodness of fit" significantly.

TABLE 6.7

THE SIGNIFICANT SEMI-PARTIAL CORRELATIONS OF THE INDEPENDENT VARIABLES WITH THE SECOND-LEVEL FACTORS AS DEPENDENT VARIABLES (for MCA IV and V)

Dependent Variables	Independent Variable	Semi-Partial Correlation
EF'_A	Dogmatism	-0.2317*
EF'_B	Dogmatism	-0.3222**

* Significant at the five per cent level
** Significant at the one per cent level

Note: The Stepwise Regression Analyses showed that no more variables were found to be significant after Step 1 (see also Appendix N).

Thus, for the ENGLISH SAMPLE, Dogmatism explained approximately 5 per cent of the variance in EF'_A and 10 per cent of the variance in EF'_B. The corresponding figures in India were 10 and 18 per cent approximately. The same results were obtained even if the variable FAMILIARITY was treated as a continuous variable.

Results of the first-order partial correlation analyses

As Table 6.8 shows, the simple correlations between Experience of Bureaucracy and the second-level factors (EF'_A and EF'_B) were reduced to almost zero when Dogmatism was partialled out. The correlation between Dogmatism and Experience of Bureaucracy ($r = .304$, $P < .01$, Appendix N) was significant.

However, as in India, the simple correlations between Experience of Bureaucracy and the second-level factors were not significant and consequently no importance could be attached to these results.

TABLE 6.8

THE CORRELATIONS OF EXPERIENCE OF BUREAUCRACY WITH THE SECOND-LEVEL FACTORS OF ATTITUDE TO CURRICULUM INNOVATION (WITH DOGMATISM PARTIALLED OUT)

"Independent" Variable	"Dependent" Variable	Simple Correlation	First-Order Partial Correlation (with Dogmatism partialled out)
Experience of Bureaucracy	EF'_A	-.154 (n.s.)	-.091
	EF'_B	-.184 (n.s.)	-.095

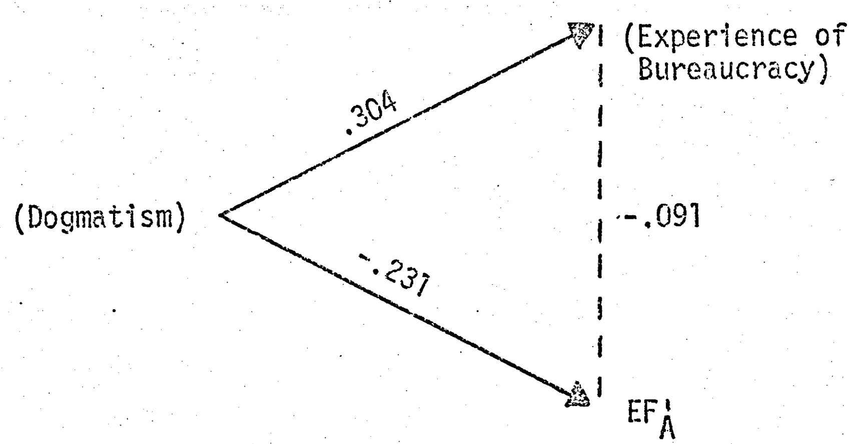
(Note: The direction for scoring EF'_A was reversed here)
($P_{.05} = .217$, df = 80)

Nevertheless, these results gave some support to the models that we proposed for the pattern of relationships between Dogmatism, Experience of Bureaucracy and the second-level factors of attitude to curriculum innovation in the MAIN FAMILIAR SAMPLE in India (see Chapter 4). The same models were therefore drawn for the data obtained from the ENGLISH SAMPLE (see Figure 6.4).

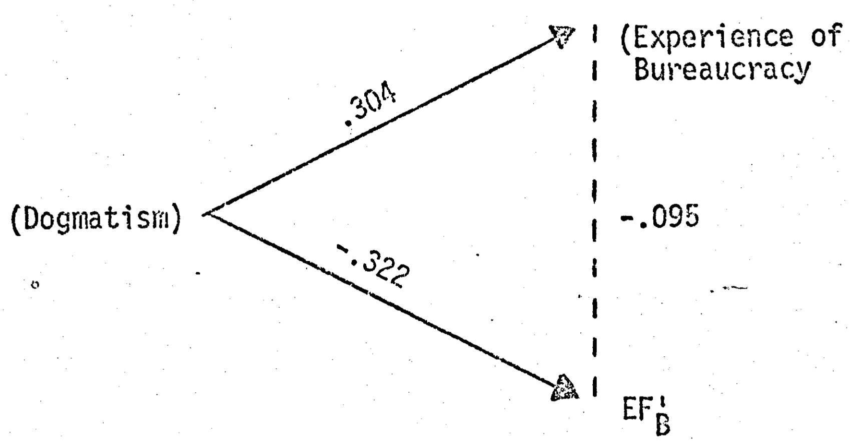
FIGURE 6.4

SIMPLE CAUSAL MODELS FOR THE RELATIONSHIPS BETWEEN DOGMATISM, EXPERIENCE OF BUREAUCRACY, AND THE SECOND-LEVEL FACTORS OF ATTITUDE TO CURRICULUM INNOVATION

A. Simple causal model for EF'_A



B. Simple causal model for EF'_B



(Note: EF'_A = Support for the design, content and teaching requirements of the new curriculum.

EF'_B = Belief in the professional competence of teachers for initiating and implementing curriculum innovation.)

6.4.2 THE RESULTS FOR THE EXTENSION STUDY

6.4.2.1 THE SUMMARY DATA FOR RIGIDITY, NEUROTICISM AND EXTRAVERSION

The means and standard deviations of the scores for these PERSONALITY variables are shown in Table 6.9. Norms for the population of Secondary School teachers of Mathematics in England were not available. In comparison with the published norms for teachers in general (Eysenck and Eysenck, 1971), the mean score for Neuroticism in the ENGLISH SAMPLE was slightly higher than that in the Standardization Sample though not significantly so ('t' =.25) (Appendix E). On the other hand, the mean score for Extraversion in the ENGLISH SAMPLE was slightly less than in the Standardization Sample ('t' =-.52). However, the compositions of these two samples were different in that the proportion of women teachers in our sample was much lower than in the Standardization Sample (34 per cent in the ENGLISH SAMPLE against 71 per cent in the Standardization Sample).

TABLE 6.9

MEANS AND STANDARD DEVIATIONS OF THE SCORES FOR THE PERSONALITY VARIABLES

	Personality Variables					
Sample	Rigidity		Neuroticism		Extraversion	
	M	SD	M	SD	M	SD
The ENGLISH SAMPLE (n = 82)	65.0	10.007	10.121	5.169	10.365	3.713

Note: The range of possible scores was as follows:

for Rigidity: 22 to 110
for Neuroticism: 0 to 24
for Extraversion: 0 to 24

The frequency distributions for Neuroticism and for Rigidity (Appendix N) were slightly skewed in the ENGLISH SAMPLE. However, it was assumed that the distributions were normal in the population. The distribution for Extraversion was symmetrical.

6.4.2.2 THE RESULTS OF THE FIRST-ORDER FACTOR ANALYSIS OF THE INTERCORRELATIONS OF THE PERSONALITY VARIABLES

The results of the Principal Components Analysis of the product-moment intercorrelations of the four PERSONALITY tests (Dogmatism, Rigidity, Neuroticism and Extraversion) were as shown in Appendix N. Two factors were extracted; actually, the latent root for one of these was slightly lower than 1. Both factors were rotated. The results of the Varimax Rotation are given in Table 6.10.

Dogmatism, Rigidity and Neuroticism emerged as a single psychological factor (Factor I). As we have already indicated, this factor was designated as RF_1 and interpreted as a factor of emotional Resistance because of the high loadings of Dogmatism, Rigidity and Neuroticism on it. It was a factor rooted in the emotional make-up of individuals and was labelled the Emotionality-RESISTIVITY FACTOR. The factor scores for RF_1 were obtained as part of the output statistics from the computer. However, the scores were reversed in direction because all the salient variables loaded negatively on the factor. In this way, high factor scores implied high Emotionality-RESISTIVITY.

The intercorrelations between Dogmatism, Rigidity and Neuroticism were in the expected range. Table 6.10 shows that the correlation between Dogmatism and Neuroticism ($r = 0.403$, $P < .01$) was significant and substantial. It was quite close to the correlation coefficient

TABLE 6.10

A. MATRIX OF THE PRODUCT-MOMENT INTERCORRELATIONS OF THE PERSONALITY VARIABLES FOR THE ENGLISH SAMPLE (n = 90)

	The Personality Variables			
	Dogmatism	Rigidity	Neuroticism	Extraversion
Dogmatism	-			
Rigidity	0.578 ** (0.608)**	-		
Neuroticism	0.403 ** (0.410)**	0.219 * (0.236)*	-	
Extraversion	-0.121 (-0.134)	-0.229 * (-0.266)*	-0.042 (-0.057)	-

* Significant at the five per cent level
** Significant at the one per cent level

($P_{.05}$ = .205 for df = 90; $P_{.01}$ = .267 for df = 90)
($P_{.05}$ = .217 for df = 80; $P_{.01}$ = .283 for df = 80)

Note: (a) The sample size here was 90 not 82 (see text)
(b) The correlations in brackets were for sample size 82.

B. VARIMAX ANALYSIS OF THE PERSONALITY VARIABLES IN THE ENGLISH SAMPLE (n = 90)

Personality Variables	Rotated Factor Loadings		Communality (h^2) %
	I	II	
Dogmatism	-.857	-.160	76.0
Rigidity	-.696	-.432	67.1
Neuroticism	-.737	.214	58.9
Extraversion	.022	.924	85.4
Percentage Variance	47.01	24.85	

Note: Factor I was the Emotionality-RESISTIVITY FACTOR (RF_1) and Factor II the Conditionability-RESISTIVITY FACTOR (RF_2).

between Dogmatism and Anxiety ($r = 0.36$, $n = 60$) reported by Rokeach (1960) for English workers but not so close to that reported for College students in England ($r = 0.47$, $n = 80$). However, in these studies Anxiety was measured by the Minnesota Multiphasic Personality Inventory (MMPI) and as explained in Chapter 2, Neuroticism was not identical with Anxiety. The correlation coefficient between Dogmatism and Rigidity ($r = 0.578$, $P < .01$) was within the range of coefficients found by Rokeach (1960) and by Rokeach and Fruchter (1956) (i.e. from $r = 0.37$ to $r = 0.62$).

The second factor of RESISTIVITY (RF_2) was less "important" than RF_1 in the sense that it explained only about half of the amount of variance in PERSONALITY accounted for by RF_1. Because of the extremely high loading (0.924) of Extraversion on that factor, it was interpreted as one of conditionability and designated as the Conditionability-RESISTIVITY FACTOR. Rigidity too had a significant loading (-.432) on that factor and the correlation between Rigidity and Extraversion was significant ($r = -0.229$, $P < .05$).

6.4.2.3 THE RESULTS OF THE CORRELATION ANALYSES FOR THE EXTENSION STUDY

The Results of the zero-order correlations between the PERSONALITY variables and the second-level factors of attitude to curriculum innovation

The results shown in Table 6.11 supported Sub-Hypothesis VI concerning the relationship between Neuroticism and "Belief in the professional competence of teachers for initiating and implementing curriculum innovation" (EF'_B). The hypothesis was rejected for the relationship between Neuroticism and EF'_A (Support for the design, content and teaching requirements of the NEW CURRICULUM). Similar results were observed for Rigidity.

The results also supported Sub-Hypothesis VII; that is, there was no linear relationship between Extraversion and the teachers' attitudes to curriculum innovation.

TABLE 6.11

THE ZERO-ORDER CORRELATIONS BETWEEN PERSONALITY VARIABLES AND TEACHERS' ATTITUDES TO CURRICULUM INNOVATION IN THE ENGLISH SAMPLE (n = 82)

		The PERSONALITY Variables			
		Dogmatism	Rigidity	Neuroticism	Extraversion
The second-level factors of attitude to curriculum innovation	EF'_A	-.231*	-.144	-.104	.043
	EF'_B	-.322**	-.302**	-.258*	-.022

* Significant at the five per cent level ($P_{.05}$ = .217, df = 80)
** Significant at the one per cent level ($P_{.01}$ = .283, df = 80)

The Results of the Multiple Correlation Analyses (VI) and (VII)

The results in Table 6.12 show that the Emotionality-RESISTIVITY FACTOR correlated significantly and negatively with both EF'_A and EF'_B as expected; and thus Sub-Hypothesis VIII received considerable support.

TABLE 6.12

THE SEMI-PARTIAL CORRELATIONS FOR THE SECOND-LEVEL FACTORS OF ATTITUDE TO CURRICULUM INNOVATION (for MCA VI and VII)

A. The Semi-Partial correlations of the independent variables with EF'_A as dependent variable

Independent Variable	Semi-Partial Correlation
The Emotionality-RESISTIVITY FACTOR (RF_1)	-0.246*

. No more variables were found to be significant.

B. The Semi-Partial correlations of the independent variables with EF_B' as dependent variable

Independent Variable	Semi-Partial Correlation
The Emotionality-RESISTIVITY FACTOR (RF_1)	-0.341**
AGE	-0.241*

No more variables were found to be significant.

* Significant at the five per cent level
** Significant at the one per cent level

The significant correlation between AGE and EF_B' was an interesting result because the simple correlation between these two variables was only of border-line significance ($r = -.221$, $P_{.05} = .217$ for df = 80; see Table 6.6). As Table 6.7 shows, when Dogmatism was controlled, the correlation between EF_B' and AGE was no longer significant probably because Dogmatism and AGE themselves correlated to a small extent ($r = .111$, Appendix N). On the other hand the correlation between RF_1 and AGE was near-zero ($r = .019$) and controlling RF_1 did not lower the correlation between EF_B' and AGE.

The Emotionality-RESISTIVITY FACTOR (RF_1) then explained about 6 per cent of the variance in EF_A' and about 12 per cent of the variance in EF_B'. Thus, the amount of variance in the teachers' attitudes to curriculum innovation accounted for by RF_1 was only slightly greater than that accounted for by Dogmatism on its own by approximately one per cent for EF'_A and two per cent for EF'_B. The Multiple Correlation for EF'_B was approximately 0.4.

6.5 THE ANALYSIS OF RESULTS

Crocker (1974) has made a point concerning the use of PERSONALITY questionnaires which could be of relevance here. He said that frequently reliance was placed on the low proportions of people from original samples who actually completed PERSONALITY questionnaires or who volunteered to do so. He wondered whether it was a higher level of fear or of insecurity that made those people who refused to co-operate or forget to return a form different from those who volunteered to be probed and to give time to filling in questionnaires. Since in the present study about two-thirds of the teachers of mathematics who attended the conference returned all the questionnaires properly completed, our ENGLISH SAMPLE was probably not representative of teachers with a very high level of anxiety if we assumed that those who did not complete the questionnaires had a higher level of anxiety than those who did. At all events, the limitations to generalisation imposed by our sampling procedures were considerable.

On the other hand, the results gave ample support to the hypothesis that there was a significant, negative correlation between teachers' levels of Dogmatism and their attitudes to curriculum innovation as measured by the second-level factors. Since the findings of the original study in India concerning these relationships were replicated for quite different levels of Dogmatism in England, our hypothesis gained a great deal in tenability.

The experience of Bureaucracy in the ENGLISH SAMPLE was more moderate than in the Indian MAIN FAMILIAR SAMPLE and the implication was that within their respective institutions the former participated to a greater extent in decision-making than the latter. It seems that as organizational structures, the schools represented in the ENGLISH SAMPLE were less centralized and less formalized than the Polytechnics in Tamil Nadu.

Lastly, although the other forms of RESISTANCE-within-PERSONALITY did not increase substantially the proportion of "explained" variance in the teachers' attitudes to curriculum innovation, an interesting feature of the results was that Sub-Hypothesis VI (concerning the relationships between the teachers' attitudes to curriculum innovation and Rigidity) was supported for EF'_B but not for EF'_A. As Dogmatism correlated significantly with both EF'_A and EF'_B the results for Rigidity could be interpreted in terms of the theoretical distinction which Rokeach made between Dogmatism and Rigidity (see Chapter 2). Dogmatism referred to the resistance to change in <u>systems of beliefs</u> whereas Rigidity referred to resistance to change in <u>single beliefs</u>. The results seemed to suggest that for EF'_A individual differences in RESISTANCE-within-PERSONALITY to change were related more to the difficulties experienced in integrating the new sets of beliefs into a whole and new system of beliefs about the curriculum, than to the difficulties experienced in overcoming single well-established beliefs.

CHAPTER 7

DISCUSSION AND CONCLUSIONS

In this final chapter we give an overview of the findings of our piece of research and our conclusions. However, in attempting to summarise the study as a whole, details are ignored, only some main implications are outlined and a certain amount of repetition occurs.

This research was in the main concerned with obtaining estimates of the relative contributions of selected PERSONALITY and SITUATIONAL variables to the variation in teachers' attitudes to curriculum innovation in "formal organizations". Teachers' opinions concerning two specific curriculum innovations (one in Engineering Drawing in TAMIL NADU and one in Secondary Schools Mathematics in England) were utilized as a basis for deriving measures of teachers' attitudes to curriculum innovation. The technique of Multiple Correlation Analysis enabled us to determine the semi-partial correlations between these attitudes and the selected PERSONALITY and SITUATIONAL variables. Table 7.1 summarises our findings.

Had it been solely a matter of dimensioning the universe of the teachers' attitudes to the curriculum innovation in TAMIL NADU and of developing reliable measures of these dimensions, our methodology would have been different; it would have been simple and clear also. The three main sections of the questionnaire about curriculum innovation (Q7, Q8 and Q10) would have been coalesced into a single, continuous list of items; only one oblique first-order factor analysis of all these items would have been done and this would have been followed by a second-order factor analysis. The complexity of the present research design and of the structure of our questionnaire about curriculum innovation was a consequence firstly of our intention to verify our hypotheses about the relationships between teachers' attitudes to

TABLE 7.1

SIGNIFICANT SEMI-PARTIAL CORRELATIONS BETWEEN DEPENDENT AND INDEPENDENT VARIABLES IN DIFFERENT SAMPLES

		Dependent variables				
		in the MAIN FAMILIAR SAMPLE in India (n = 80)		in the COMBINED GROUP in India (n = 134)	in the ENGLISH SAMPLE (n = 82)	
Independent variables		F'_A	F'_B	f_1	EF'_A	EF'_B
PERSONALITY variables (RESISTANCE-within-PERSONALITY)	Dogmatism	-.323**	-.421**	-.344**	-.232*	-.322**
	The Emotionality-RESISTIVITY FACTOR				-.246*	-.341**
KNOWLEDGE of curriculum innovation variables	FAMILIARITY			.258**		
	Attendance on a COURSE	-.269*				
BACKGROUND INFORMATION variables	AGE					-.241*

* significant at the 5 per cent level

** significant at the 1 per cent level

Note: 1. The hatched cells indicate that the independent variables were not in the explanatory framework for these particular samples (see text).

2. The empty cells mean that the observed correlations were not significant.

3. The semi-Partial correlations for other BACKGROUND INFORMATION variables and for the Organization variable were not significant.

4. For the designation of the dependent variables, see Chapters 4 and 6.

curriculum innovation and the variable FAMILIARITY. Secondly, there was the necessity to replicate the findings of our research in India with a sample of teachers in England. As a result, the overall design of the present research may appear to be lacking in singleness of purpose. But in fact, the main purpose of the research was simple and straightforward enough: to develop reliable measures of teachers' attitudes to curriculum innovation and to use these measures for testing specific hypotheses concerning postulated relationships between these attitudes and the selected PERSONALITY and SITUATIONAL variables.

An important outcome of our design was that 23 items (that is, about 35 per cent of the items from Sections Q7, Q8, Q10 of our questionnaire about curriculum innovation in India) had to be jettisoned. Such a casualty was the price to be paid for the sake of obtaining homogeneity in our clusters of items . It could be argued that the dimensioning of the universe of teachers' attitudes to curriculum innovation by the alternative and customary procedure briefly outlined above (that is, from the total list of items) would have yielded yet more dimensions than the few which we had obtained. In other words, it could be said that the dimensions of attitude to curriculum innovation which were identified did not mirror the complete dimensionality of the universe. And unfortunately, it was only after the REPLICATION STUDY in England was completed that it occurred to us that it was possible to assemble all the remaining twenty-three items (that is, those which had not been already taken up for defining the dimensions) and to cluster their inter-correlations. But, as Appendix O shows, when the analysis of these rejected items was done, only one first-level factor with an acceptable level of reliability was identified. It was a factor of attitudes about the practical aspects of curriculum implementation and was characterised by four marker variables.

However, the upshot of our approach to the problem of dimensionality for the universe of teachers' attitudes to curriculum innovation at the second-level of factor analysis was the identification of two major, orthogonal dimensions. Each of these had its own representative cluster of marker variables and the cluster had its own specification equation. Each accounted for a relatively small percentage of the total variance in the teachers' responses in India (28.6% and 17.7%, respectively). But as Hope (1967) has pointed out the percentage of variance for which a factor accounted was not necessarily a good guide to its importance from a non-statistical point of view. Moreover, our contention was that the two dimensions were readily interpreted. Admittedly, our interpretations were subjective, but as we have explained, our second-level factors stood together with the first-level factors in a tight factorial structure within the nomological net, and had therefore both meaning and significance.

There were two further points to stress in connection with our two second-level factors. The first was that the reductionism of our quantitative, nomothetic approach to the study of teachers' attitudes to curriculum innovation was in opposition to the modern trend in curriculum evaluation towards the "illuminative" research methodology. But as we have pointed out in Chapter 3, the present study was not designed to be an evaluative study of curriculum innovation. The other point was that the finding of two clearly orthogonal dimensions did not give support to the proposition of a "general attitude towards change" (Lin, 1966; Rogers, 1971) to which we referred in Chapters 1 and 3. Instead, the two dimensions pointed to the existence of attitudes centred on two quite distinct issues in the context of curriculum innovation: the "content" and "method" (or "form") of curriculum innovation, respectively.

Turning now to the results of our correlation analyses, the striking feature of Table 7.1 was that (predictably) it showed that RESISTANCE-within-PERSONALITY in the form of Dogmatism was indeed a contributing factor to the variance in the teachers' attitudes to curriculum innovation. The table also showed that according to the evidence presented here, the Organization variable (Experience of Bureaucracy) and the BACKGROUND INFORMATION variables (except AGE) did not contribute significantly to the variance in the teachers' attitudes. And even AGE did not explain a significant proportion of the variance when Dogmatism was controlled (see Table 6.7). Moreover, our proposed causal models in Chapters 4 and 6 showed that the correlations between Experience of Bureaucracy and the second-level factors of attitude to curriculum innovation both in India and in England were not zero because Dogmatism was a correlate of both Experience of Bureaucracy and the second-level factors. It seems that the teachers' experience of bureaucracy in itself did not account for their lack of support for curriculum innovation and lack of belief in their own professional competence for involvement in curriculum innovation. Instead, Dogmatism was probably the underlying factor which influenced both their perceptions of Bureaucracy and their perceptions of curriculum innovation. This finding is specially remarkable when we take account of the large and significant differences between the ENGLISH SAMPLE and the MAIN FAMILIAR SAMPLE in their levels of Dogmatism and in their reported Experiences of Bureaucracy. However, as we have demonstrated in our analysis of results in Chapter 4, our proposed causal models were not without ambiguity.

It must be pointed out too that our findings concerning the relationships between the independent variables and the dependent variables in the study had to be weighed against the limitations of our method of correlation analysis. The point was that the multiple correlation coefficient represented the correlation between a dependent variable and a weighted combination of independent variables, and capitalized upon any chance deviations (Guilford, 1956). Its value was therefore inflated. This meant that the total amount of variance (that is, the squared multiple correlation) in the teachers' attitudes which was explained by our explanatory framework was even lower than the observed "goodness of fit" in India and in England. However, by submitting our data to the statistical technique of Multiple Correlation Analysis, it was at least possible to conclude with confidence that RESISTANCE-within-PERSONALITY contributed a significant amount to the variance in the teachers' attitudes to curriculum innovation. This amount was not so low that it could simply be thrown into the "error" term of our explanatory framework. At the same time, however, we had to admit that the proportion of variance which remained "unexplained" by our explanatory framework was quite high. Probably, the framework was not comprehensive enough on the side of the independent variables. Our quasi-illuminative study in India had in fact indicated the possibility that other variables such as the teachers' perceptions of the new examination scheme and their presentation of themselves as competent "lecturers" might account for yet more of the variance in their attitudes.

However, the significant correlations of Dogmatism with both second-level factors of attitudes showed convincingly that the polarisation in the teachers' attitudes was in part accounted for by resistance which lodged within their own personality make-up; it seems that such resistance was triggered into action by the task of accommodating new ideas about both the "content" and "method" of curriculum innovation into the teachers' existing belief-disbelief systems. In particular, the correlation with the dimension of "content" was suggestive of a kind of syllabus-bound orientation (Hudson, 1968; Parlett, 1969) amongst some teachers if one were to extrapolate the findings of research about orientations in studying (Josephs and Smithers,1975) to orientations in teaching! Had we stayed closer to the perceptual plane, at the first-level of factor analysis, and not penetrated deeper into the nomological network of the teachers' responses to curriculum innovation, we would not have detected this pervasive influence of Dogmatism. The findings gave some support therefore to one of our criticisms of previous studies, namely, that these studies investigated teachers' reactions to curriculum innovation at the level of single items or of specific, first-order factors only.

However, the scientific approach to hypothesis testing was such that no amount of confirmation could finally prove our hypothesis of a significant relationship between Dogmatism and teachers' attitudes to curriculum innovation. The most that we could say was that our hypothesis had "escaped disproof" (MacKay, 1974). For the hypothesis to gain our confidence it had to "escape disproof" repeatedly when tested with many more samples of "TEACHERS-INVOLVED-IN-CURRICULUM INNOVATION", under many different conditions. Moreover, such replications could throw light on the likely variations in the size of the correlations between Dogmatism and the teachers' attitudes to curriculum innovation.

However, the difficulties encountered when replicating studies in the field of curriculum innovation were brought to light in our own Replication Study. Thus, we had attempted a comparison between the results of cross-sectional studies in two samples of teachers engaged in two different innovations as if the comparison was one between "stable states" (Schon, 1971) and as if the two innovations were at the same stages in their developments at the time of our research. Yet our own theoretical analysis of the psychological process which mediated the adoption A_s (or rejection) of curriculum innovation (see Chapter 2) had led us to the belief that the dynamics of attitude change in the context of curriculum innovation were very complex indeed, and consequently, comparisons such as ours between cross-sectional studies made at different stages in the development of different curricula were probably of limited value.

Nevertheless, it was tempting to suggest that for a particular sample of teachers the strengths of the relationships between the factors of attitudes to curriculum innovation and Dogmatism depended on the average level of Dogmatism within that sample because the correlations in the ENGLISH SAMPLE were consistently of a slightly lower order of magnitude than the corresponding correlations in the MAIN FAMILIAR SAMPLE in India (see Table 7.1). On the other hand, we were mindful of the finding by Jamias (1965) that the size of the correlation between Dogmatism and the rate of adoption of an innovation seemed to depend on the degree to which innovativeness was valued so that, even among highly Dogmatic persons, those living where a high value was placed on innovativeness adopted the recommendations of change agents more frequently than those living where a low value was placed on innovativeness. Admittedly, Jamias' research dealt with the adoption of new agricultural practices and not with new educational practices! Nevertheless, it seems possible to surmise that the last ten years or so of curriculum innovation in England have probably imparted considerable value to notions like innovation and innovativeness within the English educational system and that as a result a certain amount of receptivity to new ideas and practices has been fostered amongst school teachers. By contrast, for the Polytechnic teachers in TAMIL NADU, the curriculum innovation in Engineering Drawing seems to have been their only personal experience of the winds of change in the curriculum field. We wondered therefore to what extent the difference in the correlation coefficients between the teachers' attitudes to curriculum innovation and Dogmatism in these two samples depended on the value placed on innovativeness within the respective educational communities.

Of course, correlations were not everything. They were based on collective data and no clear meanings could be attached to them for explaining reactions at the individual level; that is, we could not infer from correlations that were obtained with groups to mechanisms which worked at the individual level. However, Rokeach has proposed an explanation of the ways in which the Dogmatic mind worked along each of the three dimensions of Dogmatism (the Belief-Disbelief dimension, the Central-Peripheral dimension and the Time-Perspective dimension) (see Chapter 2). Consequently, what we did as a post hoc analysis was to study the relationships between each of these dimensions and each of our second-level factors of the teachers' attitudes. We found that both in India and in England (see Appendices N and J) the single highest correlation was that between the Central-Peripheral dimension and the teachers' belief in their own professional competence for initiating and implementing curriculum innovation. ($r = -.399$, $P. < .01$, for F_B' and $r = -.317$, $P < .01$ for EF_B'). It seems then that the teachers' attitudes concerning professional competence were closely associated with the tendency to reject or accept new information after screening it for compatibility with existing beliefs. We wondered whether, for teachers, information about curriculum innovation was accommodated into the individual's belief-disbelief system in much the same way that Rokeach had described for new beliefs about the social world; that is, new information was screened for compatibility with existing beliefs about professional competence. Some of these beliefs could perhaps be described as "basic" in Black's (1946) sense of the term, that is, beliefs without reasons. Black has remarked that many of our basic notions concerning morality, "the good life", economics, education and "other important matters" were probably acquired through believing assertions taken for granted by society at large; and it would be interesting to determine what these "basic beliefs" were when it came to the question of professional competence in teaching. However, the mechanism for the accommodation of new beliefs into the belief-disbelief system was only hypothetical. We were mindful of Ehrlich's (1969) discussion of the proposition that the theorist must be prepared to demonstrate that if A was more dogmatic than B, then A was "more closed-minded about religion, about interpersonal relations, about his self-imagery, about his politics, and so on"; and of his conclusion that the intensive, systematic and large-scale case studies that were required to test this theoretical proposition had not been attempted. However, we would suggest that the results of our cross-national research as they stood have given some evidence that if teacher A was more dogmatic than teacher B, the likelihood was that A was more closed-minded about the curriculum also. But of course, it was by no means clear what function intervening variables (such as the centrality of the teachers' beliefs about the curriculum) served in this relationship.

Now, probably the most outstanding finding of the present study was the extraordinarily high average level of Dogmatism (Mean = 195.9 for n = 160) observed among the Indian Polytechnic teachers of SOUTH INDIA, specially as they were from four different States. Instances of very high levels of Dogmatism have been reported by Rokeach (1960) for a group of English workers (Mean = 175.8) and for a group of institutionalised veterans in America (Mean = 183.2). But as we have seen in Chapter 4, more commonly, the reported average level of Dogmatism ranged between 125 and 170 approximately. The interpretation favoured by Rokeach (1960) for the unusually high Dogmatism scores of the English workers and of the American veterans was that these people tended in general to agree more often with statements presented to them than other groups (such as college students) and their acquiescence could be attributed to a lower level of education, to senility or to demoralization.

However, for us the pertinent question was: how could we account for the large and significant difference in the average levels of Dogmatism between our sample of Polytechnic teachers in India and our sample of Secondary School teachers in England, specially as there were differences for all the three dimensions of Dogmatism (see Appendix N)?

A number of reasons could be invoked. An obvious one was that the subjects that teachers in the two samples taught were different! The teachers in India were Engineers by training whilst the teachers in England were Mathematicians. It was also possible (like Rokeach) to see in the high scores obtained by the Indian Polytechnic teachers the effect of a strong "acquiescence response set", a form of bias referred to in Chapter 3.

However, we explored another possibility; it seemed to us that an explanation might be given in terms of social attitudes and could rest on recent findings concerning Dogmatism in a sample of college students in England (Lobley, 1974; Smithers and Lobley, 1978). Lobley found that twenty-seven of the forty items in the Dogmatism Scale E were indeed measuring General Authoritarianism, as there were no significant differences between the dogmatic responses of the extreme Conservatives and the dogmatic responses of the extreme Radicals in the sample. However, for the remaining thirteen items of the Dogmatism Scale, there were significant differences between the extreme Conservatives and the extreme Radicals in their dogmatic responses, and for the great majority of these thirteen items, the Conservatives among the College Students obtained higher scores than the Radicals. A possible inference could be that the Polytechnic teachers in India had probably more conservative attitudes than the Secondary School teachers in England and seemed more predisposed than the latter to agree strongly with the "conservative items" identified by Lobley. However, our own item-by-item comparison of the teachers' scores in the ENGLISH SAMPLE with the teachers' scores in the MAIN FAMILIAR SAMPLE (see Appendix N) shows that for 34 of the 40 items in the Dogmatism Scale E, the Polytechnic teachers in India obtained significantly higher scores than the teachers in the ENGLISH SAMPLE. The differences in mean scores were most significant for "intolerance towards disbelievers" (Item 30), for "belief in a cause" (Item 20) and for the "concern with power and status" (Item 16). It seems likely therefore that the difference in the levels of Dogmatism between the two samples was genuinely one in General Authoritarianism as measured by Rokeach's Dogmatism scale and was not determined by a few "conservative items". The question then was why were the Polytechnic teachers in India so much more authoritarian than the Secondary School teachers of Mathematics in England.

It seemed profitable at this point to discuss the possible socio-cultural determinants of Dogmatism as a PERSONALITY variable. The discussion must remain largely speculative because of our lack of hard data in this connection. The starting point for the discussion is again the notion that teachers' reactions result from the interaction between PERSONALITY and SITUATIONAL variables; this notion has been a major guiding theoretical light for the present study. However, although in the present study we have assumed all along that RESISTANCE-within-PERSONALITY as measured by the Dogmatism Scale was an independent variable and was antecedent to teachers' attitudes to curriculum innovation, such RESISTANCE-within-PERSONALITY might itself be dependent on situational variables. Indeed, in Chapter 3 we have described Dogmatism as a phenotypic variable and a common theoretical position was that PERSONALITY cannot be isolated from the social totality within which it occurs (Adorno, 1950; Le Vine, 1973). What then were the SITUATIONAL factors (mainly socio-cultural) which were likely to account for the extraordinarily high level of Dogmatism observed amongst the Polytechnic teachers in India?

In considering this question it seems convenient in the present study to distinguish three ways in which, according to Bengston and Lovejoy (1973), values arise from and are reinforced by configurations of social systems. At the most general level, values are culturally defined through various methods of social control such as folklore and taboos. At another level, values stem from one's location within the broader society, that is, from belonging to social groupings such as classes or castes. At still another level, values arise from a particular social location such as an occupational group. If then we were to account for the extraordinarily high level of Dogmatism of our Indian Polytechnic teachers we should look at the teachers' adaptations to their social environments within these levels. Unfortunately, our short stay in India did not allow us to digress in our empirical work from the concern of the present study which was to determine quantitatively the contributions of selected variables to teachers' attitudes to curriculum innovation. Moreover, in seeking to study the linkage between the high level of Dogmatism among the Indian Polytechnic teachers and their social location as teachers, we discovered that there was apparently no published research studies which focused specifically on the PERSONALITY traits and social backgrounds of Polytechnic teachers in India.

Nevertheless, we turned to the Indian literature about school teachers in general and found that, according to Damle (1970), in INDIA school-teachers belonged to the middle class and they carried with them "the peculiarities of their social class" in respect of values and attitudes and of "the preoccupation with security and stability". It seemed too that the caste system in India worked as a mechanism for the allocation of personnel over different occupations; and as Gore and others (1970) implied, the economic conditions of the so-called "scheduled" castes and of "other backward"castes just did not apparently permit them to acquire the higher educational qualifications necessary to teach in secondary schools.

But there was a paradox. It might have been thought that the nonverbal disciplines of science and technology would have enhanced the mobility of the newer social groups (the lower social classes) who are nevertheless coming into the educational structure. But in point of fact, according to Gusfield (1970), the Brahmin and other high castes tend increasingly now to dominate technical and scientific areas. They are more likely to enter these areas and they are more likely to continue in them once they have entered. On the other hand, the lower castes and the lower-income segments of the high castes appear to be moving into government and administration. We were left wondering therefore whether the Polytechnic teachers on the whole belonged to the higher social classes and whether their dogmatism stemmed from belonging to these classes.

Another illuminating point about teachers in India was that there was too much deference to teachers and to knowledge. King (1970) puts it very succintly thus: "the teacher knows". King also remarks that in a cultural context where student disturbances are daily occurrences, it may seem outrageous to state that there is too much respect for authority and yet this seems to be the case. There is a "too overly felt respect" for the opinions of those occupying higher positions on a hierarchical social ladder. "Respect for age, and authority is paramount." Taneja (1970) has described "the lustre" with which the Hindus invested the word "teacher"; he says that by tradition knowledge was possible only through the teacher and that he (the teacher) was "almost deified". This stereotype may be said to have remained unchanged "even in modern times" according to Yamunacharya (1970).

In the absence of evidence to the contrary it seems reasonable to assume that the Polytechnic teachers were probably trying to live up to this kind of expectation about teachers and that they had themselves learnt to revere their own teachers and others in authority over them, such authority being apparently invested in the family, in religion, and in certain castes. (Gusfield, 1970; Yadav, 1974). If, therefore, like Rokeach, we conceive of a psychological continuum which extends from rational, tentative reliance on authority at one extreme to arbitrary, absolute reliance at the other extreme, then the Polytechnic teachers were probably close to the latter extremity of the continuum. And as Rokeach has explained, the greater the belief in absolute authority the more closed the belief-disbelief system.

But although our results in India and in England had given considerable support to our hypothesis concerning the relationship between Dogmatism and the teachers' attitudes to curriculum innovation, to have studied this relationship without studying also the relationship of these attitudes to other forms of RESISTANCE-within-PERSONALITY would have left uncovered the significant effect of the emotional make-up of teachers on their attitudes to the form of curriculum innovation. The suggestion from our findings in England seemed to be that the threat to the teachers' professional competence for initiating and implementing curriculum innovation ($EF_B^{\prime}$) caused emotions to soar high and provoked negative reactions among those who by their very nature were more prone to emotional arousal (that is, the Neurotics). The semi-partial correlation between EF'_B and the EMOTIONALITY-RESISTIVITY FACTOR (RF_1) was quite substantial ($r = -0.341$, $P < .01$) and the simple correlation between EF'_B and NEUROTICISM was also significant ($r = -0.258$, $P < .05$). It seems legitimate to suggest that from the standpoint of many teachers in the ENGLISH SAMPLE, curriculum innovation must have been a source of anxiety and of uncertainty. In terms of the theoretical proposition advanced in Chapter 2 such uncertainty was an intervening variable in the adoption (A_s) or rejection of innovation (see Figure 2.3). However, it had not been our intention in the Replication Study to establish empirically that such feelings of uncertainty existed amongst the teachers in the ENGLISH SAMPLE. We simply made the assumption that subjective uncertainty triggered off the defense mechanism in Dogmatic teachers and produced negative attitudes; similarly, it triggered off epistemic curiosity in Open-Minded teachers and produced positive attitudes. But it was possible to show from our quasi-illuminative study in India that about 72.5 per cent of the teachers in the MAIN FAMILIAR SAMPLE probably experienced a feeling of uncertainty about the idea that the NEW CURRICULUM motivated students to learn and that it faciliated learning (see Chapter 5). The FIELD STUDY showed too that there were probably considerable latent uncertainties concerning such issues as the restructuring of classes into sub-groups for teaching purposes and the academic respectability of the new course content.

Turning next to the KNOWLEDGE of curriculum innovation variables, the hypothesis of a significant correlation between FAMILIARITY with a specific curriculum innovation and teachers' attitudes to that same innovation received no support in India and little support in England for the second-level attitude factors. This result must cast some doubt on the proposition that through merely using the innovative support materials that are produced for a specific curriculum development project, teachers are going to develop positive attitudes towards the new curriculum.

However, the finding of a significant relationship ($r = .258$, $P < .01$) between the teachers' FAMILIARITY with a specific curriculum innovation and their attitudes to curriculum innovation in general as measured by (f_1) (Belief that teachers should take the initiative in curriculum innovation) was important. It seemed to us that it was an encouraging outcome of a curriculum development project if through using its support materials, teachers were brought to the realisation that they could themselves initiate curriculum innovation. We believed with Whitfield (1970) that teachers were more than "purveyors of other people's bright ideas"; teachers needed to be innovators in themselves. We saw the impetus that had been given to curriculum innovation in many countries in recent years being maintained largely by the continuing involvement of teachers in specific curriculum development projects which they themselves initiated. This "form" of curriculum innovation was most likely to be fruitful and to last.

However, it could be argued that although the results for (f_1) fitted our theoretical position, if we had developed a reliable measure of the variable FAMILIARITY by factor analysis (yet again!) we could have made the necessary corrections for attenuation and obtained an even better estimate of the "explained" variance. Yet, quite apart from our unwillingness to lengthen our questionnaire in India, the task of trying to sample adequately from the universe of content for the variable FAMILIARITY was a particularly daunting one in view of the philosophical implications associated with the concept of FAMILIARITY as we have explained in Chapter 2. But it could not be denied that the concept of FAMILIARITY required clarification and that a number of questions remained concerning the mechanism by which FAMILIARITY influenced teachers' responses. We should want to know, for example, how precisely did the use of innovative curriculum materials by the teachers in the MAIN FAMILIAR SAMPLE alter their perceptions of the curriculum, which features of the familiarisation process were congenial to the development of new attitudes and which were not. And it was by no means clear by what psychological process FAMILIARITY and Dogmatism jointly affected the individual's belief-disbelief system and influenced his attitudes to curriculum innovation. In other words, the mediating psychological process which we proposed in Chapter 2 required greater elaboration.

There was also the TIME factor to take into consideration when discussing the effect of FAMILIARITY. It was of some interest that when writing about this factor in relation to the diffusion of new ideas and practices in society at large, Katz (1963) had criticised the early model of mass communication which "assumed a kind of stimulus-response process" such that people immediately reacted (or did not react) to an influence attempt. Katz acknowledged that TIME had to be incorporated as a variable in the model and that innovations spread only gradually through social systems. It occurred to us that the momentum with which new ideas about the curriculum diffused in the USER SYSTEM was probably also subject to the influence of TIME. If that were so, then the appropriate methodology for studying the effects of both FAMILIARITY (as defined in the present study) and TIME would be that of longitudinal studies.

Moreover, to obtain as we did in India a significant negative correlation ($r = -.269$, $P < .05$) between Attendance on a COURSE and the second-level factor F'_A (about "content") when FAMILIARITY was not at all associated with that factor was most interesting. A question which forced itself upon us was this: what was it in attending a COURSE of specific training that was associated with the tendency to accept curriculum innovation contentwise, given that Attendance on a COURSE did not give teachers the "Knowledge of results" of their own classroom behaviours or the Knowledge of their students' classroom performance in the relevant subject area whereas FAMILIARITY did? There was probably no easy answer to that question. However, it led us to think about possible forms of In-Service courses which might be effective when the overall aim of such courses was to get teachers to "internalize" the educational values embodied in a particular set of innovative ideas and practices. It was of interest that in reviewing some recent evaluation studies of curriculum projects in England, Eraut (1976) had asked amongst other questions one which was particularly relevant, namely, what forms of In-Service courses for teachers had been most effective?

Our own view was based on the proposition that a specific innovation in the curriculum can <u>in time</u> become attractive if teachers are allowed to gain a sound theoretical knowledge of the innovative ideas and practices associated with the innovation, as well as FAMILIARITY with it. It followed that educational administrators might well question the effectiveness of short courses of only a few days' duration. If the intention of these short courses was to precipitate a dramatic acceptance of new ideas and practices by teachers it had to be realised that such precipitous acceptance was probably the exception rather than the rule. The dynamics of "catastrophes" appeared to be very complex indeed! We would like to suggest that teachers should instead be given the opportunity for attending long courses of many weeks' duration aimed at introducing whole sets of new and related ideas and practices that were relevant to a specific innovation in the curriculum. Alternatively, there should be the opportunities for attending a number of short modular courses focused on particular sets of new and relevant ideas and practices and extending over a long period of time; the modules could be arranged in a proper sequence contentwise.

There was a point of fundamental importance at issue here. A long course seemed to anchor the innovator's hope for attitude change and development in "learning" rather than in "catastrophe". It seemed likely too that greater emphasis could be placed in a long course on well known principles of learning and teaching which had now become commonplace in educational circles. Some of the principles that would appear to be relevant in this connection were the setting up of educational objectives in behavioural terms (Bloom, 1956, 1964; Wheeler, 1967; Beard, 1968; Larson (1969); Heywood, 1974, 1977), the proper management of reinforcement (Skinner, 1965), the use of "advance organizers" (Ausubel, 1963) and the provision of the correct amount of "incongruity" (Hunt, 1963) between teachers' past teaching experience and the proposed new curriculum values. This last principle implied that the new teaching models offered to teachers were not to be less complex than those which they had already implemented with competence. At the same time the new models were not to be so complex that they frustrated teachers.

Evidently, it must not be supposed that the principles of learning could not be applied on short courses! But given the "complexity" of curriculum innovations generally, it was doubtful whether attendance on a single short course that focused on a specific curriculum innovation could allow enough time for teachers to learn to value the educational principles underlying that particular innovation. A long course (or alternatively, a number of short modular courses) could in all probability provide a richer variety of experiences than a single short course and could thereby facilitate the necessary abstraction and generalisation of new concepts about the curriculum. Our own FIELD STUDY showed how the teachers in TAMIL NADU wanted longer courses. Findings from studies of cultural change were also probably relevant here. Barnett (1953) has made the pertinent point that in the context of cultural change it was "exceedingly difficult" to explain philosophical concepts, feelings and theoretical constructs. Might not this be true also in education, specially when we were dealing with curriculum innovations of a very complex nature? It was the experience of the Schools Council (1974) that the dissemination of the innovative ideas and practices of curriculum development projects was successful when teachers understood these ideas and practices sufficiently well to use them (if they chose to do so) and it seems therefore that there must be a deliberate attempt on the part of In-Service Course organizers to aim at such understanding. We found it very intriguing indeed that whilst Bloom's Taxonomy of educational objectives had brought considerable order into the area of behavioural objectives for pupil learning and had helped "to generate an educational industry" (Hamilton, 1976) (with training courses being set up to formulate objectives and item banks being established), attention had only recently been given by a few educationists (Smith, 1975; Crix, 1976; Vyas, 1977) to the application of the objectives model in Teacher-Education. This remark was specially true with regard to educational objectives in the affective domain.

In point of fact, when we look at the English scene in Teacher-Education, it is abundantly clear that the volume of research into In-Service Teacher Education generally has so far been very small indeed and has been indecisive in its results. It is admittedly true that following the James Report (1972) and the subsequent White Paper on a framework for the expansion of education (Department of Education and Science, 1972), there seems to have been a growing concern about the organization and effectiveness of In-Service courses generally. Thus, Crix (1976) has proposed a Taxonomy of objectives for the evaluation of In-Service Courses. However, Crix's list of objectives was not aimed at the internalization of the ideas and practices embodied in a specific curriculum innovation; they were meant to be of use for the evaluation of In-Service courses generally. On the other hand, prior to Crix's attempt, Smith (1975) had sought to use a Tyler-Bloom evaluation model for an In-Service course which was centred on problems affecting a primary school during a period of innovation. But Smith reported that teachers found the Tyler-Bloom model "incomprehensible" although a "detailed explanation" of each item in his questionnaire was appended to the questionnaire. Moreover, Hooton (1977) has remarked that an In-Service course planned on the basis of set goals and one-way processes makes teachers into "yes" men and makes innovation yet another routine. She suggests that teacher-trainers should encourage teachers to be creative and respect the fact that they have different aims. Could it be then that perhaps even an "objectives model" of the curriculum was not appropriate for

In-Service Teacher-Education and that a "process" model (Stenhouse, 1970/71; 1972; 1975) was to be preferred. Although as we have intimated above, the "objectives model" appealed to us, curriculum innovators and course organizers should experiment in a systematic way with In-Service courses based on both models.

It seems too that they should study the problem of measuring changes in the attitudes to curriculum innovation of teachers who attended In-Service courses which were used as a means of developing favourable attitudes (in teachers) to specific curriculum innovations. A recent study (Henderson, 1976) found that the attitudes to innovation of a group of teachers who attended an In-Service course moved a small but significant way towards the attitudes implied by the objectives of the course to be desirable. However, Henderson also found that the attitudes of the teachers at the beginning of the course marked them as being more sympathetic to the objectives of the course than their colleagues who had not applied for admission to the course!

But concerning the issue of attitude change generally, Sherif, Sherif and Nebergall (1965) have argued that before tackling the important problem of attitude change, we must have a clear notion of <u>what</u> it is that changes and <u>what</u> it is that is resistant to change; and Rokeach (1968) has criticised contemporary approaches to "attitude change" for putting the accent on the understanding of change rather than on the understanding of "attitude". It seems to us that this criticism applied to research on attitude change not only in the field of curriculum innovation but also in connection with In-Service courses that focus on specific curriculum innovations. There seems to be an absence for the most part of a clear theoretical orientation in the measurement of attitudes in these areas.

In view of the foregoing paragraphs, we shall restrict our concluding remarks to the traditional way of indicating where it seems research efforts could be concentrated in future. Whilst acknowledging the fact that the problem of the present study required of us to take a nomothetic approach to our empirical work, it now seems to us that in order to give realistic psychological explanations for the attitudes of individual teachers to curriculum innovation and to account for changes in these attitudes, idiographic approaches must in future supplement nomothetic approaches such as our own. We do not mean by this that researchers should simply adopt the "configurational approach" proposed by Rogers (1962) for following a particular individual through the various independent variables in an explanatory scheme and finding out the factors that seem to account for the individual's attitudes. Even this approach falls short of informing us about how the psychological structures underlying RESISTANCE-within-PERSONALITY (as we have studied it) relate to each other and to the teachers' attitudes to curriculum innovation. It seems instead that the incorporation of a clinical approach within longitudinal studies of samples of teachers involved in the implementation of curriculum innovations is what is probably called for; such studies should provide us with considerable insights into teachers' attitudes to curriculum innovation. Unfortunately, although in case studies of curriculum innovations such as the one reported by Gross and others (1971), teachers have been approached individually in order to obtain their reactions to curriculum innovation, no attempt has been made to extricate from these idiographic reactions, the relative contributions of PERSONALITY and SITUATIONAL variables to teachers' attitudes to curriculum innovation.

An advantage of the research strategy that we are now proposing is that it should then be possible to expose teachers to inconsistencies (of which they may be quite unaware) in their beliefs about the curriculum. This lack of awareness could be due to a number of reasons such as the uncritical internalization of contradictory values or sheer conformity. But as Rokeach (1968) has suggested, exposure to inherent contradictions is one factor which may bring about a change in a person's attitudes. It may also be that if more opportunities are provided for teachers to discuss contradictions in their beliefs about the curriculum when they attend In-Service courses which centre on specific curriculum innovations, then these courses may bring about the sort of attitudes (towards innovations) which curriculum innovators and course organizers deem to be desirable; although, of course, there is a whole variety of ego-defensive responses to change and the emotional aspects of change require sensitive understanding on the part of curriculum innovators and course organizers alike.

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CERI = Centre for Educational Research and Innovation.

OECD = Organisation for Economic Co-operation and Development.

NFER = National Foundation for Educational Research.

SCRS = Schools Council Research Studies.

SRHE = Society for Research into Higher Education.

UNESCO = United Nations Educational, Scientific and Cultural Organization.

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The contributions of selected PERSONALITY and SITUATIONAL variables to variations in teachers' attitudes to curriculum innovation

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A thesis submitted for the degree of Doctor of Philosophy (Education) of the Open University

June 1978

Date of submission: 15-6-78
Date of award: 1-12-78

VOLUME TWO

LIST OF APPENDICES

APPENDIX A

A FEW GENERAL POINTS ABOUT THE POLYTECHNICS IN INDIA AND ABOUT THE CURRICULUM INNOVATION IN ENGINEERING DRAWING IN TAMIL NADU (SOUTH INDIA)

In order to retain the confidentiality of our correspondence with the administration of Technical Education in SOUTH INDIA, the notes given here are necessarily scanty.

The Polytechnics in India were Diploma-awarding institutions (NOT degree-awarding institutions). They catered specifically for the education of Technicians by means of Full-time courses of three years duration. (Dasgupta, 1976). Students were selected to come on these courses after ten years of schooling.

According to Frankland (1971), the professional education of Polytechnic teachers was primarily the responsibility of the four Regional Technical Teachers' Training Institutes which were started in 1966, by the Central Government. By 1971, not more than five per cent of the teaching force had qualified at those Institutes.

Again, according to Frankland, there was very little "professional-level communication" either among Polytechnic teachers, themselves, or between teachers and administrators. Moreover, "a clear hierarchy of control had evolved" within the system of Polytechnic education over such matters as the syllabus and the purchase of equipment. Teachers often expressed the feeling that it was not their function to innovate, but that they could only "operate the existing systems, according to the direction of their superiors".

The curriculum innovation in Engineering Drawing in TAMIL NADU was concerned specifically with the first year of the Diploma course for Engineering Technicians. Students' Support Materials and Teachers' Support Materials were produced; these were in book form and quite voluminous! Seventeen topics had been prepared and were to be studied in 62 "sessions" of 4 hours each. The Teachers Support Materials document was a very interesting one indeed. It started with statements for the GENERAL OBJECTIVES of each topic and was followed by statements of SPECIFIC OBJECTIVES. Teachers were then presented with a series of notes on the reasons for the change in the Engineering Drawing course, how it was proposed to effect the change and what were the important features of the change. Thus teachers were told that the new curriculum materials "took advantage of known principles of learning"; the "basic idea" was that "the method" involved "maximum student activity" and the learning was "more student-centred". The teachers were also told that the students were more likely to develop their "understanding of basic principles" as these applied to industrial Engineering Drawing and that their (the students) practical skills would develop as they worked through the exercises. These effects were possible because of the new course structure, the wide range of engineering problems given, the built-in feedback which allowed for misconceptions to be corrected immediately, and the "preprepared" materials which allowed teachers "to spend much more time giving tutorial help to individual students".

The teachers were also told how to use the teaching materials; thus, "analysis sheets" were designed for the teachers to give them "comprehensive details" of each unit of work. These "analysis sheets" (see below) included amongst other things "teaching points" (that is,"key statements structured to aid learning"), "teaching and learning aids", book references, and evaluation procedures to be used. The "column type" of "lesson plans" was used, that is, details of the lesson plans were given in columns headed "teacher's activity", "student's activity", resources and time allocation (see below). The "Criterion test questions" to be used were explained; they included questions of the following types: completion type, matching type, multi-choice type, and true/false type. Answer sheets for all exercises and test questions were provided for teachers.

The extracts given below were typical of the contents of the Teachers' Support Materials. (See Figs. 1 and 2 below).

The Directorate of Technical Education for TAMIL NADU was anxious to supply "Model" Examination papers to the Polytechnics"to enable the students to be prepared properly". The format of the new type of examination paper which was ultimately given at the end of the first year of the innovation (that is, in April 1973) had some interesting features. Whereas many of the traditional questions prior to the innovation were of the type "Draw an epicycloid ...." or "Draw the plan and elevation of ....", the new type of examination paper provided students with diagrams of engineering objects which were taken from particular angles, and required the students to draw different sectional views of these same objects. Surprisingly, for each question the marking scheme was shown on the question paper. For example, for one question, the criteria for the assessments were stated to be (a) the correctness of "the views", (b) the correct use of drawing instruments and correct line thickness, (c) the correct dimensioning and (d) neatness.

One-week "CRASH COURSES" were organized by TTTI with the view of training teachers in the use of the new Curriculum materials. The programmes for these Courses included lectures on topics such as curriculum development, the analysis of syllabuses, general principles of learning, educational objectives, evaluation and testing, teaching methods, lesson plans and the selection of audio-visual aids.

"Practice sessions" were also included. These were designed to give "some basic knowledge of the educational terms" in the TTTI Support Materials and "for the familiarization purposes" of the course members with the preparation and use of the "pre-prepared curriculum materials".

FIG I TEACHERS' ANALYSIS SHEET (extract from the TEACHERS' SUPPORT MATERIALS)

GENERAL OBJECTIVE 3.0 Use Competently Engineering Drawing Instruments

Specific Objectives	Teaching Points	Student's Abilities to be Developed	Teaching Method	Teaching and Learning Aids	Book References	Evaluation	Time Hrs.
3.1 List the types of Drawing Instruments	3.1 Types of Instruments as: Basic tools, tools for drawing st. lines. Tools for drawing curved lines. Tools for measuring distances. Special tools.	3.1 Recall of knowledge	3.1 Lecture	3.1 TSM	3.1 Schneerer (1967) Programmed Graphics. McGrawHill Book Co. p.251	Objective type test (for 3.1 to 3.7) of 15 Mins.	¼
3.2 Describe in his own words the principles of using drg. instruments like pencils, T-square, set-square compass, dividers & scale	3.2 Brief description. Methods of using Application Precautions	3.2 Recall of knowledge Application	3.2 Lecture/ Demonstration	3.2 TSM Big size models of drawing instruments	3.2 Spencer (1962) Basic Tech. Drg. The Macmillan Co.p.14-35 IS 696/60p.17		¾
3.3 Select the grade of pencil to produce required line definition	3.3 Line thicknesses as per ISI. Grades of pencils. Selection of grade for different line definitions	3.3 Recall of knowledge	3.3 Lecture	3.3 TSM	3.3 IS 696/60 pp.19-20 Schneerer p.223		½
3.4 Set-off required dimensions using scales & dividers	3.4 Ref. 3.2	3.4 Recall of knowledge Applications Motor skills	3.4 Student centred learning	3.4 TSM	3.4 French & Vierck 60 Fundamentals of Engg. drg McGrawHill p.47		½

Key:
TSM = TEACHERS' SUPPORT MATERIALS

GENERAL OBJECTIVE: 3.0 Use competently Engineering Drawing Instruments (continued)

Specific Objectives	Teaching Points	Student's Abilities to be Developed	Teaching Method	Teaching and Learning Aids	Book Reference	Evaluation	Time in Hrs.
3.5 Draw straight lines (horizontal, vertical, inclined parallel and perpendicular) using T-square & set-squares	3.5 Describe methods and application. Demonstrate.	3.5 Recall of knowledge Application	3.5 Student-centred learning	3.5 TSM	3.5 Luzadder (62) Fundamentals of Engg. Drg. Prentice Hall p.72		$\frac{3}{4}$
3.6 Draw circles, circular arcs, irregular arcs using compass & french curves	3.6 Describe methods and application. Demonstrate.	3.6 Recall of knowledge Application	3.6 Student-centred learning	3.6 TSM	3.6 French Vierck p.47		1
3.7 List at least 5 factors which will help in obtaining neatness in the drawing	3.7 Common habits which can be modified	3.7 Recall of knowledge	3.7 Lecture	3.7 TSM	3.7 Spencer pp.25-26		$\frac{1}{4}$

FIG 2 LESSON PLAN (extract from TEACHERS' SUPPORT MATERIALS)

REF NO IN TEXT	TEACHER'S ACTIVITY	STUDENT'S ACTIVITY	RESOURCES	TIME
1	Introduces the need for drawing instruments - Explains the types of instruments based broadly on their uses.	Identifies tools used in drawing. Reads through notes p.1	TSM* Blackboard	$\frac{1}{4}$
2	Demonstrates the various instruments, explains their construction, method of using, their application and stresses important points to be observed in their use.	Discriminates between the different tools and their uses. Reads through notes pp 2-10	TSM Big size instruments Blackboard	$\frac{3}{4}$
3	Explains the different line definitions, grades of pencils to be used for producing these lines in a drawing.	Analyses the line definitions. Reads through notes Information Sheet 1 pp11-12	SSM* Chart	$\frac{1}{2}$
4	Guides and supervises the students	Completes student's Work sheet No.1 p.13	SSM	$\frac{1}{2}$
5	do	" W/Sheet 2 p.14	SSM	3
6	do	" W/Sheet 3 p.16	SSM	$\frac{3}{4}$
7	Explains the factors which will contribute to the neatness of a drawing.	Reads through notes p.17	SSM	$\frac{1}{4}$
8	Administers Test 1	Completes Test 1 p.18	SSM	$\frac{1}{4}$
				4

* TSM - Teachers Support Material

* SSM - Students Support Material

APPENDIX B

A FEW RELEVANT NOTES ABOUT THE CURRICULUM INNOVATION IN SECONDARY SCHOOL MATHEMATICS (IN ENGLAND) REFERRED TO IN THE TEXT

The organizers of the particular innovation in mathematics with which we were concerned in the present study had no objection to our research plans provided we could present our data and our conclusions in a way that neither mentioned the name of the innovation nor led people to deduce its name when describing our samples of teachers who attended the conferences run by the organizers themselves. Consequently, these few notes were necessarily guarded, imprecise and directed to innovation in mathematics in general, although here and there we referred to the specific innovation about which we wanted the reactions of the teachers in the ENGLISH SAMPLE. In any case, many of the points that we made about innovation in mathematics in England were applicable to the specific innovation itself.

The aim (of these notes) was to highlight some aspects of the specific curriculum innovation in mathematics with which we were concerned and to demonstrate that the innovation as a "stimulus-object" was rather similar in complexity to the Indian curriculum innovation in Engineering Drawing. We took the view that if there was such a similarity, we could then go on to assume that the pattern of teachers' reactions to the stimulation of curriculum innovation in England was probably similar to that observed in India and proceed with our cross-national comparisons.

The literature about innovation in schools mathematics in England revealed that a great deal was said about reforming the teaching of mathematics in the 1960's. There were apparently serious shortcomings in the traditional school mathematics and a number of different committees and projects were set up. The Assistant Masters Association (1973) listed no less than eleven projects which came into being between 1960 and 1967; they noted that all these projects except the Nuffield project focused on secondary schools. Now, an interesting aspect of the so-called "modern mathematics" and one which in our eyes made it somewhat similar to the Indian innovation in the Engineering Drawing curriculum, was the recognition that the teaching of mathematics needed to be better integrated with contemporary applications in industry and research. (Fletcher 1969). It was said that these applications were to be the very vehicle by which mathematics was taught. Indeed, the case for reform in mathematical education as presented at the Royaumont seminar (OECD, 1961) rested to some extent on the demand for new kinds of mathematical skills in industry and in other branches of economic activity.

From our own restricted perspective and very limited experience of teaching some elementary mathematics in Grammar schools many years ago, the study of such topics as matrix algebra, set notations, and statistics represented a curriculum innovation of some magnitude. Although we were not in a position to make penetrative judgements on the contents of the new curricula in schools mathematics, it did seem to us that the innovation in mathematics with which we were associated in the present study was a very complex one. Indeed, at the time of our research it seemed even more complex than the Indian innovation in Engineering Drawing because it (the innovation in mathematics) spanned the whole secondary school course leading to new examinations at all levels, whereas the Indian innovation had changed the curriculum for the first year of the Engineering Drawing course only. The complexity of the English innovation was immediately apparent in the sheer number of new topics, in the range of age groups which the innovation embraced, in the multiplicity of textbooks and (as in India) in the amount of support materials produced by the innovators. Amongst these, the Teachers' guides were most prominent. They were commentaries on the textbooks and included suggestions about teaching methods. They were clearly intended to help in the classroom presentation of the topics. Although the analysis of teaching points was not related explicitly to a Taxonomy of objectives as in India, nevertheless the teaching points were presented quite succinctly.

We found an interesting feature of the innovative trend in mathematics to be the recognition that many of the new psychological insights into the nature of the learning process deserved attention. Indeed, one particular project began with the attempt to formulate explicitly the learning processes involved before designing their syllabuses. The Association of Teachers of Mathematics (1969) itself described as an "ingredient" of "modern" mathematical teaching, a proper understanding of recent psychological investigations. "The days when a teacher of mathematics could shut his eyes to psychology, and dismiss it as well-meaning advice of which he had no need, or an opinion which he did not share", were gone, they said. It was the responsibility of teachers "to seek to understand the new knowledge in psychology and to use it as a basis for a technology of teaching". In the particular innovation with which we were concerned, psychological concepts like "motivated learning and learning by discovery" were expressed respectively, in terms like "encouraging in pupils an enthusiasm for mathematics", and "fostering a willingness to make and codify discoveries for themselves". The close resemblance between the implied strategy of learning in innovations in mathematics and the strategy of learning advocated by the innovators in India speaks for itself.

Two other resemblances between the English innovation in mathematics and the Indian innovation in Engineering Drawing were to be found in the new examinations and in the In-service courses organised by the innovators for teachers. It was recognised that new examinations would loosen the hold of the traditional topics and that In-service courses for teachers would, amongst other things, give teachers a chance to "cross-examine" the authors of the innovative materials.

But whilst the many similarities outlined above seemed to vindicate our proposition that the pattern of teachers' reactions to curriculum innovation in the two countries was similar there existed a major difference between the processes adopted for the initiation of the two innovations and for their subsequent diffusion. In England, the innovation in mathematics was brought about by a free association of school teachers who had a common interest in improving the teaching of mathematics by developing syllabuses, texts and other classroom materials. But in India, the innovation in Engineering Drawing was initiated by the Technical Teacher

Training Institute (an educational establishment of the Government of India), and was imposed in the state of TAMIL NADU (South India) by the Director of Technical Education for that State. However, it could be argued that in England too once a local authority or a school had decided to implement a particular curriculum innovation, as far as some teachers within that authority or school were concerned that innovation was being imposed on them although the decision might have been arrived at through democratic processes involving staff representatives.

There was yet another difference between the innovative contexts in India and in England respectively. In India the innovation was only one year old and had diffused at the same rate in all the Polytechnics when we researched into the teachers' attitudes to it. In England the situation was quite different. The publication of the first textbooks was in the mid sixties. This was preceded by some experimental work in a few pilot schools. The rate of diffusion of the innovation in the country was not uniform and, given the mobility of staff in England, the period of acquaintance with the innovation in our ENGLISH SAMPLE of teachers was likely to be uneven. Moreover, there was a slight possibility that a few of the younger teachers had themselves learnt the new mathematics whilst at school as pupils. In point of fact, there were seven teachers of age 21 or 22 in the ENGLISH SAMPLE (see Appendix N). However, three were male teachers whose responses to our questionnaires indicated that they were only "Quite Unfamiliar" with the innovative curriculum materials. The others (the four female teachers) were "Quite Familiar" with the materials. Unfortunately, one of the weak points of our questionnaire was that it yielded no information about each teacher's own school education. It was not therefore possible to determine whether the familiarity of these four women teachers with the new curriculum materials was in fact due to their own schooling. In any case, these four teachers represented only about five per cent of our ENGLISH SAMPLE.

The Course Membership of the Conference from which the "English Sample" of Secondary School Teachers of Mathematics was obtained

North of England

County Durham	:	3
Northumberland	:	1
Yorkshire and Humberside	:	69
Lincolnshire	:	3
Derbyshire	:	4
Nottinghamshire	:	5
Lancashire	:	18
Cheshire	:	5
TOTAL		108

South of England and East Anglia

East Anglia	:	1
Northamptonshire	:	1
Warwickshire	:	1
Buckinghamshire	:	2
Oxfordshire	:	1
Gloucestershire	:	1
Hertfordshire	:	1
London	:	6
Sussex	:	1
Surry	:	1
Hampshire	:	2
Somerset	:	1
TOTAL		19

Wales	:	1

APPENDIX C

1. The Sequence of Procedures used for (a) developing the Interview Schedules, the Questionnaires, the Recording Sheets (for on-site observations) and for (b) collecting the data

Location and Date	Procedures
A. In England (1972-73)	The Review of the relevant literature about curriculum innovation in general.
B. In India (Madras) (March 1973)	1. Determining the objectives, the scope, and the manner of the curriculum innovation in Engineering Drawing (as perceived at the official level). 2. Determining the resources (financial, material, and human) that were available for our study. 3. Interviewing the staff of the Curriculum Development Unit and other members of the RESOURCE SYSTEM to find out more about the innovation: its objectives, stage of development, policies, and effectiveness; the problems encountered, the materials diffused and so on (see Interview Schedule Q1, Appendix E). 4. Interviewing the recipients of the innovative materials in the USER SYSTEM, in order to obtain some of their reactions and feelings (see Interview Schedule Q2, Appendix E). 5. Obtaining the relevant documents and reports about the innovation. 6. Planning of the next visit to India with the staff of the Education Research Unit at TTTI; setting up target dates for the FIELD STUDY of the Polytechnics in TAMIL NADU.
C. In England (April to June 1973)	1. Administering an open-ended questionnaire, Q3, (see Appendix E) to Secondary School Teachers of Mathematics attending a conference on an innovative mathematics project in order to obtain their reactions to the curriculum innovation in mathematics. 2. Categorising the statements made by teachers and other participants in innovation in India and in England.

Location and Date	Procedures
	3. Designing the questionnaires, Q4 and Q5, from the collected statements (see Appendix E). 4. Administering questionnaire, Q4, to groups of Technical Teachers on In-Service Courses in order to refine the questionnaire.
D. In India (Madras) (July to September 1973)	1. Discussing the proposed questionnaires, Q4 to Q12 with TTTI staff. 2. Designing the RECORDING SHEETS (Q13, Q14) for the FIELD STUDY (see Appendix E). 3. The FIELD STUDY in TAMIL NADU; Administering questionnaires, Q6, Q7, Q8, Q9, Q10, Q11, Q12 at Regional Centres in TAMIL NADU and making on-site recordings (Q13, Q14). 4. Organising the data collection for the teachers in the States of Kerala, Mysore and Andhra Pradesh.
E. In England (1973-74)	1. Factor Analysis of the Indian teachers' responses to the questionnaires about curriculum innovation (Q7, Q8, Q9, Q10) and the development of measures of attitudes to curriculum innovation. 2. Adapting the questionnaire items in the attitude measures for use with another group of Secondary School teachers of Mathematics in England attending a conference on the same innovative Mathematics project. 3. Administering questionnaires Q15, Q16, Q17, Q18, Q19, Q20, Q21, Q22 to a group of Secondary School teachers of Mathematics in England.

APPENDIX D

DETAILS OF THE PRELIMINARY STUDIES (THE STUDY OF THE RELEVANT LITERATURE, THE COLLECTION OF EXPERT OPINIONS, AND THE ADMINISTRATION OF AN OPEN-ENDED QUESTIONNAIRE ABOUT CURRICULUM INNOVATION IN MATHEMATICS)

1. The Study of the Relevant Literature

First among the preliminary studies was the survey of the relevant literature. The immediate objective of this survey was to discover the salient features of innovations in general and of the Engineering Drawing innovation in particular. The survey was started before we went to India.
It entailed a study of the literature about change and innovation in general, and about innovation in education and in the curriculum. This literature was referred to in our discussion of the background theory and of the procedures for the present study (Chapters 2 and 3).

However, when arriving in Madras, we had to acquaint ourselves immediately with the innovation in Engineering Drawing itself through a study of the documents that were made available to us. There were two key "SUPPORT MATERIALS": one was for Teachers and the other for Students (Appendix A). The former laid down the educational principles on which the innovation was founded, whilst the latter gave a concrete idea of what students were expected to do. These Support Materials provided us with a wealth of information, and the literature survey as a whole enabled us to derive a useful framework for the construction of our open-ended INTERVIEW SCHEDULES.

However, in searching the literature, the measurement of the dependent variables in the present study (that is, the teachers' attitudes to curriculum innovation) took pride of place; that is, we looked for those aspects of curriculum innovation which seemed to produce strong emotions in teachers. At the same time we looked for independent variables other than PERSONALITY which could explain some of the expected variation in the teachers' attitudes to curriculum innovation.

2. The Interviews of individuals in the RESOURCE and USER sub-SYSTEMS

Two INTERVIEW SCHEDULES (Q1 and Q2, see Appendix E) were developed on the basis of the literature survey. There were a number of objectives for these interviews:

(a) The first objective was to get to know the context in which the innovation in TAMIL NADU took place and the "learning milieu" in which it was being implemented. This was part of our "quasi-illuminative" research strategy that we tried to adopt as we explained in our description of the FIELD STUDY (Chapter 5).

(b) The second objective (as explained in the text) was to obtain statements which could thereafter be used as items for the set of questionnaires that were to be developed for measuring teachers' attitudes to curriculum innovation.

(c) The third objective was to ensure that we used terms in our questionnaires that were like those that the teachers used themselves and that had roughly similar meaning for most of them and for us.

(d) The fourth objective was to assess the extent of the variation in the teachers' perceptions of the innovation.

The interviewees themselves were simply told that the aim of the interviews was to elicit some basic facts about the overall circumstances and conditions in which the innovation was initiated and about its impact on the Polytechnics.

The interviews for the RESOURCE sub-SYSTEM were done on a individual basis as were the interviews of teachers in the USER sub-SYSTEM. However,in the short time allocated for these interviews (Appendix C) we had to share the interviews in the USER sub-SYSTEM (but not those in the RESOURCE sub-SYSTEM) with TTTI colleagues who were working with us in the Education Research Unit. The interviews were in English. For the USER sub-SYSTEM the interviews were at first recorded on tape but with practice at interviewing we found that we could record the interviewees' statements straightaway on paper. Twenty-four questions were planned for the RESOURCE sub-SYSTEM and four individuals associated with the Curriculum Development Unit were interviewed. Twenty-three questions were asked to each of the teachers from the USER sub-SYSTEM and 13 teachers were interviewed in all. All interviews were in English and were done at the Technical Teacher Training Institute, Madras. The interviewees from the USER sub-SYSTEM came from a variety of Polytechnics in the Madras region; and to that extent there was some built-in bias in their statements since the interviewees were close to the continuous and pervasive influence of the Teacher Training Institute (TTTI). But this did not seem too important in terms of our stated objectives. To select interviewees at random at this stage of our study was pointless because the overall plan was to assemble the teachers of Engineering Drawing later, in different Regional Centres (as explained in the text). It was hoped in this way to get as high a response rate as possible in these Centres. Nevertheless, as Table 1 overleaf showed, even at this preliminary stage we attempted to obtain a wide range of opinions from teachers working under very diverse conditions: some in Government Polytechnics, others in Private Polytechnics; some in Large and some in Small Polytechnics.

Table 1 Distribution of teachers interviewed with the INTERVIEW SCHEDULE Q2 (by Type, Size and Nearness of Polytechnic, and Professional Training)-

				Teachers	
				Trained	Untrained
Polytechnics	Private	Small	Very Near	2	2
			Near	1	1
		Large	Very Near	-	-
			Near	-	-
	Government	Small	Very Near	1	-
			Near	2	-
		Large	Very Near	1	2
			Near	-	1

For the actual construction of the INTERVIEW SCHEDULES, we found ourselves drawing as necessary on the procedures usually associated with the methodology of CASE STUDIES and with that of EVALUATION RESEARCH. The fact that it was not our aim to make a CASE STUDY of the innovation or to EVALUATE it did not prevent us from looking into these methodologies for procedures that could be adopted. Thus the insights provided by the Case Studies compiled by Miles (1964) were useful. These Case Studies drew our attention to such things as the assumptions and theories underlying a particular innovation, the introduction of the innovation to the teaching staff, the retrospective comments made by the participants, the stages in the production of the innovative curriculum materials, the necessity of "workshop" sessions for teachers and so on.

The Case Studies concerning problems of innovation reported by OECD were also of considerable use. Thus we noted that among the general guidelines given for the case studies of innovations in higher education (Burgess and Pratt, 1971) an analysis of the rationale behind innovations should be made and that consideration should be given to such questions as to who were the initiators of the innovations and what groups or factors provided support for or resistance to the innovations. Furthermore the circumstances which led to the creation and promulgation of a particular innovation were to be studied together with the difficulties which arose and the way in which arrangements were transformed under the influence of unforeseen factors and circumstances. A useful framework for the analysis of the innovation in TAMIL NADU would have been that provided by Collier (1974) but unfortunately this came too late for us. In addition to examining Case Studies of innovation in Education we paid due consideration to the procedures described for case studies in general; among these procedures were (a) the collection of source materials such as publications, reports, memoranda and letters, and (b) the need for interviewing key personnel about the new policies. (Bauer, 1955; Grossman, 1965).

From EVALUATION RESEARCH in education we obtained useful insights concerning criteria for effective leadership for the improvement of educational programs. Thus, according to the Association for Supervision and Curriculum Development (Doll, 1964), some of these criteria were group communication and resources. We were also able to see from the literature on Evaluation research the importance of process variables in the evaluation of innovative curricula. The contention was that whereas several different curricula could produce the same desired set of competencies, differences in the teaching-learning process could have different influences on the teachers' attitudes; consequently knowledge of the teaching-learning process was as important in evaluation procedures as knowledge of the product. Examples of process variables were the emphasis on work habits, the availability and variety of instructional materials and the provision for independent study and inquiry. (Keeves, 1972).

As we have intimated in Chapter 4, another strategy was to elaborate on the relationships between the RESOURCE and USER sub-SYSTEMS in the process of curriculum innovation (Fig. 4.2). Using the model in Fig. 4.2, we turned to the analytic frameworks provided by INNOVATION THEORY in order to determine the factors which entered into the various stages in the process of innovation and which were therefore potentially capable of influencing the teachers' reactions to curriculum innovation. Well-known analytic schemes provided us with a comprehensive list of such factors. In the main, our INTERVIEW SCHEDULES were built around the following:-

(a) Havelock's (1971) factors for the prediction of successful innovation such as "proximity", "linkage" and "openness".

(b) Rogers' (1971) perceived attributes of innovations such as "complexity", "relative advantage" and "compatibility".

(c) Matthijssen's (1969) sociological factors in educational innovation generally (bureaucratization, professionalization and ossification)

(d) Kelly's (1970) factors for innovation in the curriculum specifically; these were, for example, the communication of innovation (including training courses for teachers) and the "innovation climate" (including considerations of values and prestige).

Although these schemes were listed as discrete there was some overlap between them, but that in itself served to reinforce the importance of certain factors. Moreover, many of the factors in these schemes were to be found elsewhere in the relevant literature, for example, in Lionberger's (1964) summary of the characteristics of innovations and in Kushner's (1962) inventory of propositions for sociocultural change. The schemes served as a background against which we were able to analyse the innovative process for the Engineering Drawing innovation and derive a number of possible questions for our interviews. For example, the "complexity" factor (Chapter 2) prompted us to ask the question to the teachers whether they had experienced difficulties in terms of the complexity of the innovative material. (See Appendix E). Our discussion in Chapter 2 showed how important we believed that factor to be. Another important factor was "proximity". According to Havelock, research showed "over and over again" that proximity to the source of innovation was a good predictor of innovative behaviour: the greater the opportunity for meaningful contact between the originators of an innovation and the members of the USER SYSTEM, the greater was the likelihood of the innovation diffusing through the system. The importance of proximity in curriculum innovation was demonstrated, for example, in Tawney's (1973) comment on Project Technology. He noted that the majority of teachers felt that they were too isolated from the controlling body and that they would have liked a visit from a member of the resource team. Concerning psychological proximity and the mutual stimulation that ensued from it, Owen (1970) has described the embarrassment observed between local authority advisers (who attempted to manage change from outside the school) and teachers. Owen added that such embarrassment was due in part to the prevailing belief among teachers that the adviser's view of teaching was "idealistic, theoretical and detached from the solution of day-to-day classroom problems". We inferred that "proximity" was likely to be of some consequence for the adoption of the innovation in a state like TAMIL NADU where some of the Polytechnics were hundreds of miles from the RESOURCE SYSTEM in Madras. It seemed therefore that questions needed to be directed to the factor of "proximity" in our interviews.

Similarly, another factor which captured our attention was that listed by Rogers (1971) as "compatibility". This was the degree to which an innovation was perceived as consistent with the existing values, past experiences and needs of the receivers of the new idea or practice. Compatibility ensured less risk to the USER and was expected to be positively related to the rate of adoption of the innovation. The relationship between "compatibility" and rate of adoption led Kelly (1970) to expect a slower rate of adoption for the O-level Nuffield Biology course because it had less compatibility with prior practice than the A-level course. The factor of "compatibility" therefore prompted us to ask questions about the ways in which the NEW CURRICULUM TTTI materials were different from those previously used and about the possibility of integrating the new materials within the overall technician course. Incompatibility and the risk which it entailed could render teachers unwilling to welcome the innovation. Risk taking was in any case a pertinent factor in innovation acceptance (Bhola, 1965) and teachers had to be questioned about it.

Such research literature about the Polytechnic teachers in India as was available at the time was also consulted. The research was fragmentary; however, a study of the role incompatibilities of technical teachers and their principals in South Indian Polytechnics (Frankland, 1971) was particularly relevant and impressive. It asked a few pertinent questions such as, (a) if new curricula were instituted, would technical teachers be prepared to learn different methods of teaching and (b) if new instructional materials became available, would technical teachers modify their methods of teaching to make full use of them? It seemed therefore that new curricula and new instructional materials required a shift in teacher behaviour. In the words of MacDonald and Rudduck (1971), they required an "unlearning" of teaching habits and their replacement by new habits. As we saw in Appendix A, according to Frankland, technical teachers in South India often expressed the feeling that it was not their function to innovate but that they simply operated the existing systems according to the directives given by their superiors.

These were some of the points, problems and perspectives underlying our INTERVIEW SCHEDULES. As Appendix E showed, a number of questions were formulated and those on seemingly related topics were grouped under the same heading.

3. The opinions of experts in industry and in Technical Education

The opinions of experts from industry and from Technical Education were sought in order to widen our perspective of the innovative process in India and possibly to reach further into the teachers' world and the universe of attitude content. We interviewed one industrialist who was on the Advisory Committee for the innovation in Engineering Drawing, one officer of the Directorate of Technical Education in Madras and one professor of engineering who was not a member of the Curriculum Development Unit at TTTI. This set of interviews was not structured.

4. The administration of an open-ended questionnaire to Secondary School teachers in England about curriculum innovation in Mathematics

On returning to England from our first visit to Madras (See Appendix C) we immediately administered an open-ended questionnaire (See Appendix E) to a group of Secondary School teachers attending a conference on a particular curriculum innovation in Mathematics. The conference members were simply told that there was a stack of these questionnaires just outside the conference room and that if they so wished they could complete these questionnaires quite anonymously and return them to us. Thirty-five teachers returned the questionnaires completed, an estimated response rate of approximately 30 per cent. The opinions of the teachers were summarised and categorised. The administration of this questionnaire was but a preliminary step in the development of the structured questionnaires that were used in India and in the Replication Study in England (See Chapter 4).

APPENDIX E

The Interview Schedules, the Questionnaires and the RECORDING SHEETS

APPENDIX E

THE INTERVIEW SCHEDULE FOR THE RESOURCE SYSTEM

Q 1

(NOTE: Only the questions asked were reproduced here)

Introduction

The broad aim of this interview is to attempt to elicit some basic facts about the overall circumstances and conditions in which the innovation was initiated and about its impact on the "Polytechnics".

THE QUESTIONS

1. What do you personally see as the "innovation"? (e.g. is it an innovation in teacher-training for teachers of technical subjects, or is it the development of curriculum materials)

2. What were the objectives of the innovation? (in terms of, for example, the acquisition of knowledge, skills, attitudes)

3. What circumstances led to the initiation of the innovation?

4. How was the curriculum development group formed?

5. Were (a) teachers, (b) advisers/consultants, (c) students involved at all?

6. (a) What was the status of the teachers involved and how many teachers started and remained in the curriculum development group?

   (b) Were teachers outside the nucleus of innovating teachers informed initially of the innovation?

7. What was the pattern of interpersonal relationships within the curriculum development group? (e.g. the style of leadership, the degree of formality, the degree of interaction amongst the group members)

8. Was the development group concerned with imparting an understanding of certain adopted procedures as these relate to curriculum theory?

9. How was the curriculum development project piloted (if at all) and how was the evaluation of the pilot study made (if at all)?

10. Was it difficult to communicate the new concepts to the Polytechnic teachers? If so, why?

11. Were there ways for helping teachers to interpret the feedback from their own teaching? (e.g. were courses run in order to help teachers to understand the underlying education principles)

12. In what ways are the new curriculum materials different from those previously used?

13. Was it possible to integrate adequately the various aspects of the new materials within the overall course?

14. What do you think of the rate of diffusion and of adoption of the curriculum materials in the Polytechnics?

15. What kind of attitudes about the new curriculum materials prevailed among "Polytechnic" teachers (a) before, and (b) after the diffusion of the innovation?

16. How did the "Polytechnic" teachers react to the innovation (e.g. were they interested in the "nuts and bolts" rather than in the abstractions of the curriculum)

17. Did the need for curriculum innovation arise from amongst the "Polytechnic" teachers themselves (e.g. were teachers confronted with a specific problem?)

18. Did the teachers tend to interpret any difficulty they experienced in the implementation of the innovation, as a reflection on their own competence, or on the competence of the project?

19. What shift do you think has occurred in teachers' classroom behaviours during the period of the innovation (e.g. a shift from "tell and do" to following up student suggestions.)

20. Did the teachers look to the development team for answers?

21. How "open" and eager are the teachers to receiving new ideas?

    Are they willing to take risks?

22. How much time, training, repetition and adaption do you think the teachers require?

23. What else do you feel must be done to improve the curriculum in Engineering Drawing?

24. What do you think of the allocation of resources for such an innovation?

APPENDIX E (Continued)

THE GENERAL PLAN FOR THE INTERVIEW SCHEDULE (Q1) FOR INDIVIDUALS IN THE RESOURCE SYSTEM

The Innovation (in general)

q. 1 Perception of the innovation
q. 2 Objectives of the innovation
q. 3 Circumstances leading to the innovation

The curriculum development group

q. 4 The formation of the group
q. 5 Composition of the group
q. 6 The members of the group
q. 7 Relationships within the group

The Work of the Group

q. 8 The approach of the group to the curriculum
q. 9 Pilot study for the curriculum innovation
q.10 The communication of new concepts
q.11 Crash training courses for teachers

The curriculum materials

q.12 Differences between the new and the old curriculum materials
q.13 Integration of the new materials within the overall course
q.14 (a) the use of the new materials by the teachers
(b) the rates of diffusion and of adoption of the new materials

The Polytechnic Teachers

q.15 Prevalent attitudes of Polytechnic teachers
q.16 Reactions of Polytechnic teachers
q.17 Teachers' need for innovation
q.18 Teachers' interpretations of difficulties
q.19 Shift in teachers' behaviours
q.20 Teachers' dependence on the team of curriculum developers
q.21 The openness of Polytechnic teachers

Some other general questions

q.22 Time for training and the adaption required by the teachers
q.23 What is necessary for further improvement of the curriculum
q.24 The allocation of resources for the implementation of innovation

APPENDIX E (Continued)

INTERVIEW SCHEDULE FOR THE USER SYSTEM

Q 2

(NOTE: Only the questions asked were reproduced here)

Introduction

The broad aim of this interview is to elicit some basic facts about the overall circumstances and conditions in which curriculum innovation was initiated and about its impact on the "Polytechnics"

THE QUESTIONS

1. What is your feeling about innovation in general? (e.g. do you think teachers want innovation?)

2. In particular, what do you think of the innovation taking place currently? (e.g. is it acceptable, is it flexible enough, have you any reservations?)

3. Is the current innovation seen as one with some prestige by the Polytechnic teachers?

4. How do you feel about the content of the new curriculum materials? (in terms of, for example, the knowledge, skills and attitudes to be acquired, level of difficulty, and relevance to students' jobs)

5. How do you find the instructions accompanying the curriculum materials? (e.g. are they explicit enough, was it easy to try them out?)

6. Do you think that you can use the new materials to your students' benefit?

7. Have you experienced any difficulties (administrative, pedagogical, technical with the curriculum materials)? (e.g. in terms of their complexity, compatibility, triability)

8. What do you think of the rate of diffusion, and of the rate of adoption of the new materials?

9. How do you feel about "others" (i.e. the innovators) doing the fundamental thinking instead of you?

10. Do you think there is a real need at present for teachers to review their educational objectives and their methods of teaching?

11. Do you think that the application of the scientific method in education helps towards a greater understanding and knowledge of the educational process?

12. Are you more concerned with maintaining the status quo than with taking risks with curriculum innovation?

13. What shift (if any) has occurred in your classroom behaviour, or in your attitudes to teaching, as a result of the innovation? (e.g. a shift from 'tell and do' to following up students' suggestions and ideas)

14. Do you feel that the innovation has required of you an "unlearning" of teaching habits, and that this has bred diffidence?

15. What do you think will be the effect of the innovation on examination results?

16. Do you feel that the innovation has imposed too much strain on teachers or students?

17. Do you feel that the innovation has lessened your initiative for change and your control over the curriculum?

18. How do you like the idea of "sitting at the feet" of the curriculum innovators?

19. What do you think of the courses about development run by the innovators? (e.g. has there been a cross-fertilisation of ideas)

20. Do you see the view of teaching advocated by the curriculum innovators as idealistic and detached from the solution of day-to-day problems?

21. Do you think that the curriculum development unit is too remote geographically from the Polytechnics for it to have a big impact?

22. Are you rewarded (financially or otherwise) for proposing or implementing new ideas?

23. What do you think of the allocation of resources for such an innovation?

APPENDIX E (Continued)

THE GENERAL PLAN FOR THE INTERVIEW SCHEDULE (Q2) FOR TEACHERS IN THE USER SYSTEM

The Innovation

q. 1 General feelings about innovation in general
q. 2 General reactions to the current innovation - any reservations
q. 3 Perception of the innovation as having prestige

The curriculum materials

q. 4 Feelings about the content of the curriculum materials
q. 5 The quality of the instructions accompanying the materials
q. 6 Are the materials seen as advantageous?
q. 7 Difficulties experienced with the materials
q. 8 The rate of diffusion and of adoption

The Polytechnic Teachers

q. 9 Feelings about the innovators
q.10 The teachers' perception of the need for curriculum renewal
q.11 Feelings about the scientific method as applied in education
q.12 The concern with taking risks with innovation

The effect of innovation on teachers

q.13 The shift in attitudes and behaviours
q.14 The "unlearning" of teaching habits
q.15 The effect on examination results
q.16 The strain on teachers and students
q.17 The lessening of initiative for change

The perception of the resource system

q.18 "Sitting at the feet" of the innovators
q.19 The courses run by the innovators
q.20 The innovators' view of teaching as idealistic and detached
q.21 The curriculum development unit as geographically remote

Some general questions

q.22 The rewards for teachers who propose and/or implement new ideas
q.23 The allocation of resources for the implementation of innovation

APPENDIX E (Continued)

Q3

AN OPEN-ENDED QUESTIONNAIRE ABOUT THE TEACHING OF NEW MATHEMATICS IN SECONDARY SCHOOLS

It would be most helpful if you could tell us what you think about the teaching of NEW MATHEMATICS in general as well as with reference to a specific innovation that you are familiar with. You might, for example, consider any one or more of the following:

The problems (administrative and pedagogical) encountered in teaching the new syllabus, in preparing test questions and in setting examination papers; the relevance of some of the topics, the adequacy of the instructions that accompany the support materials, the adequacy of communication with the innovators of the materials and so on.

You will note that you are not required to give your name. Please feel free to say whatever you feel about NEW MATHEMATICS.

Please write your comments on the attached sheet.

APPENDIX E (Continued)

Q4

QUESTIONNAIRE ON CURRICULUM INNOVATION

Introduction

As you probably know, a lot has been said about changing the curriculum for College/Polytechnic students. Sometimes the term used for describing such changes in the curriculum is curriculum innovation.

The aim of this questionnaire is to find out what practising teachers/lecturers like yourself think of curriculum changes.

Below are a number of statements about curriculum innovation. Mark each statement according to how much you agree or disagree with it. Place an appropriate number in the column on the right hand side according to the following scheme.

1 : Strongly disagree
2 : Disagree
3 : Uncertain/don't know/irrelevant
4 : Agree
5 : Strongly agree

Please give your personal opinion on these statements. There are no right or wrong responses. Your opinion is what matters. Do not take too much time over each statement.

---

1. I welcome curriculum innovation ....
2. Curriculum innovation is needed in Colleges/ Polytechnics ....
3. I wish students did not have to study such a lot of irrelevant subject matter ....
4. Only curriculum innovation will reduce the number of students who drop out of College/ Polytechnic courses ....
5. It is the fault of the curriculum that teaching is of a low standard ....
6. Without academic freedom in Colleges/ Polytechnics, there can be no curriculum innovation ....
7. Actually, it is up to the Head of Department to initiate curriculum innovation in his department ....

8. Curriculum innovation is out of the question without additional resources to implement it ....

9. It is nonsense to say that teachers/ lecturers have too much to do to find time for curriculum innovation ....

10. Curriculum innovation should be the responsibility of College/Polytechnic lecturers ....

11. It is for teacher-trainers to find out what is wrong with the curriculum ....

12. Practising teachers/lecturers should definitely be involved when new curriculum materials are being developed ....

13. Students should be involved in curriculum innovation at all stages and not only as guinea pigs when new materials are being tested ....

14. I do not mind who changes the curriculum so long as the new curriculum is an improvement on the old ....

15. It is a complete waste of time for the teacher/lecturer to try new ideas unless the Head of Department approves of them ....

16. There is no incentive whatsoever for the teacher/lecturer to initiate curriculum innovation ....

APPENDIX E (Continued)

Q5

QUESTIONNAIRE ABOUT THE CURRICULUM INNOVATION IN ENGINEERING DRAWING

Introduction

The aim of this questionnaire is to find out what practising teachers in Polytechnics think about the TTTI Curriculum materials, and other available existing course materials.

Please indicate below how far you agree or disagree with each of the given statements as it applies to these materials. Place an appropriate number in each of the columns on the right hand side according to the following scheme.

5 : Strongly agree
4 : Agree
3 : Not sure
2 : Disagree
1 : Strongly disagree

	Other existing materials	TTTI Materials
1. The materials relate the topics closely to industrial practices and applications.		
2. It is clearly stated what the student should be able to do when he has worked through the materials.		
3. Teaching materials for the topics are easily available.		
4. Student materials in the form of workbooks are easily available for the topics.		
5. The teaching materials involve students in as much activity as possible.		
6. The materials enable students to develop a good understanding of basic principles as they apply to industrial engineering drawing.		

	Other existing materials	TTTI materials
7. The materials enable students to develop practical drafting skills.		
8. A wide range of engineering problems are included in the materials.		
9. The materials are so written that they allow the teacher more time for individual help to students.		
10. The materials include details of lesson plans.		
11. The materials include methods of teaching the topics.		
12. The materials give information about depth of treatment for the topics.		
13. The materials include exercises for students.		
14. The materials include test questions to evaluate learning		
15. The materials provide students with feedback of their performance.		
16. The materials are designed for student completion (eg. completion of class notes, completion of sketches or drawings, completion of programmes.)		

APPENDIX E (Continued)

Q6

Date	
Name of State	

Classification of Polytechnic (Put a circle around the appropriate number below)		
A	Government	1
	Private	2
B	Small	3
	Large	4

INTRODUCTION

The Education Research Unit of the Technical Teachers' Training Institute (Madras) is currently involved in a programme of research on curriculum (course) materials used in Engineering Drawing courses in Polytechnics. The present questionnaire(s) is/are aimed at finding out the reactions of instructors/lecturers to the curriculum (course) materials currently in use for teaching and studying Engineering Drawing .

The term "Curriculum (Course) Materials" here refers to the text books, printed handouts, book extracts, visual aids, practice exercises, questionnaires and other documents used in the teaching and study of Engineering drawing. The materials may be verbal or non-verbal.

Your responses to the various items in the questionnaire(s) will be treated as strictly confidential and you do not need to give your name. Your responses are required for the purpose of research only.

The staff of the Education Research Unit would be most grateful to you if you would kindly co-operate with them in this research project. Please complete the questionnaires and return them as directed by the Education Research Unit, Technical Teachers' Training Institute, Madras, immediately.

Many thanks indeed for your co-operation.

Q6

OFFICE USE						

1. What is your present position? (Please put a circle around the appropriate number in the margin on the right)

DEMONSTRATOR	1
JUNIOR INSTRUCTOR	2
SENIOR INSTRUCTOR	3
WORKSHOP SUPERINTENDENT	4
ASSOCIATE LECTURER	5
LECTURER	6
LECTURER IN CHARGE	7
HEAD OF DEPARTMENT	8

2. How many years have you been teaching in technical institutions?

Less than five years	1
Five to ten years	2
More than ten years	3

3. Are you the holder of a Diploma in technical teaching awarded by one of the TTTI's in India?

Yes	1
No	2

4. The TTTI (Madras) has been developing curriculum (course) materials for the Engineering Drawing course. Please indicate to what extent you are familiar with these materials.

Very Unfamiliar (ie you have never seen the materials or don't know anything about these materials)...	1
Quite Unfamiliar (ie you have seen the materials but have never used them)................	2
Quite Familiar (ie you have used some units of the materials) ...	3
Very Familiar (ie you have used most of the units of the materials)	4

5. Have you attended one of the crash training programmes which TTTI (Madras) runs to train Polytechnic staff in the use of Engineering Drawing curriculum (course) materials?

Yes	1
No	2

APPENDIX E (Continued)

Q7

EDUCATION RESEARCH UNIT

Curriculum Innovation

As you probably know, a lot has been said about changing the curriculum for Polytechnic students. Sometimes the term used for describing such changes in the curriculum is "curriculum innovation".

The aim of this questionnaire is to find out what practising instructors/ lecturers like yourself think of curriculum changes in Polytechnics for engineering students.

Below are a number of statements about curriculum innovation. Please mark each statement according to how much you agree or disagree with it. Put a circle around the appropriate number in the margin on the right. Mark every statement.

1. Strongly agree.
2. Agree.
3. Uncertain/not sure/ don't know/ irrelevant.
4. Disagree.
5. Strongly disagree.

Please give your personal opinion on these statements. There are no right or wrong responses. Your opinion is what matters. Please work fairly quickly.

OFFICE USE						

---

1. I welcome curriculum innovation	1	2	3	4	5
2. Curriculum innovation is needed in Polytechnics	1	2	3	4	5
3. I wish students did not have to study such a lot of irrelevant subject matter	1	2	3	4	5
4. Only curriculum innovation will reduce the number of students who fail their courses	1	2	3	4	5
5. It is because of the syllabus that teaching is of low standard	1	2	3	4	5

6. Without autonomy in Polytechnics, there can be no curriculum innovation	1 2 3 4 5
7. Actually, it is up to the Head of Department to initiate curriculum innovation in his department	1 2 3 4 5
8. Curriculum innovation is not possible without additional resources to implement it	1 2 3 4 5
9. Instructors/lecturers have so much work that they have no time for curriculum innovation	1 2 3 4 5
10. Curriculum innovation should be the responsibility of Polytechnic instructors/lecturers	1 2 3 4 5
11. It is for teacher-trainers (lecturers at the TTTI's) to find out what is wrong with the curriculum of Polytechnic courses (in engineering)	1 2 3 4 5
12. Practising instructors/lecturers should definitely be involved when new curriculum (course) materials are being written and tried out	1 2 3 4 5
13. Students should be involved in curriculum innovation at all stages	1 2 3 4 5
14. Practising engineers should be involved in planning new engineering courses	1 2 3 4 5
15. I do not mind who changes the curriculum so long as the new curriculum is an improvement on the old	1 2 3 4 5
16. It is a waste of time for the instructor/lecturer to try new ideas unless the Head of Department approves of them	1 2 3 4 5
17. There is no incentive for the instructor/lecturer to initiate curriculum innovation	1 2 3 4 5

APPENDIX E (Continued)

Q8

EDUCATION RESEARCH UNIT

Reactions to course materials

The aim of this questionnaire is to find out how teachers of Engineering Drawing react to the course materials currently in use for learning and teaching engineering drawing.

****

Please name one or more books or any other course materials that you currently use for learning/teaching engineering drawing:

Below are a number of statements about the engineering drawing course materials that you use. Mark each statement according to how much you agree or disagree with it. Put a circle around the appropriate number in the margin on the right. Mark every statement.

1. Strongly agree.

2. Agree.

3. Uncertain/not sure/don't know/irrelevant.

4. Disagree.

5. Strongly disagree.

Please give your personal opinion on these statements. There are no right or wrong responses. This is not a test of knowledge and ability. Your opinion is what matters. Do not take too much time over each statement.

OFFICE USE						

	Other Existing Materials	TTTI Materials
1. There is an attempt to relate the topics covered in the course materials closely to industrial drawings	1 2 3 4 5	1 2 3 4 5
2. The course materials enable students to develop a good understanding of the basic principles of engineering	1 2 3 4 5	1 2 3 4 5
3. The course materials enable students to develop practical drafting skills	1 2 3 4 5	1 2 3 4 5
4. The course materials are written in such a way that they allow the teacher plenty of time for individual help to students .	1 2 3 4 5	1 2 3 4 5
5. The course materials provide students with so much information that the teacher does not have to do much lecturing	1 2 3 4 5	1 2 3 4 5
6. Students do not find the course materials too easy or too difficult to understand	1 2 3 4 5	1 2 3 4 5
7. The course materials contain too many details and students get rather confused	1 2 3 4 5	1 2 3 4 5
8. The course materials make students discuss a lot with the teacher	1 2 3 4 5	1 2 3 4 5
9. For each topic, a number of practice exercises are given in which students complete sketches and drawings....................	1 2 3 4 5	1 2 3 4 5
10. The exercises are arranged in such a way that students do the easy ones first before going to the difficult exercises	1 2 3 4 5	1 2 3 4 5

11. The materials allow sufficient time for completing the exercises	1 2 3 4 5	1 2 3 4 5
12. There is no attempt in the course materials to show the application of general principles of engineering drawing to specific jobs in industry	1 2 3 4 5	1 2 3 4 5
13. The weakness of the course materials is that they only deal in general with the principles of engineering drawing	1 2 3 4 5	1 2 3 4 5
14. Students find that the course materials are not useful for understanding the construction of machine parts	1 2 3 4 5	1 2 3 4 5
15. Students are not getting sufficient guidance from their teachers to learn properly from the course materials used ..	1 2 3 4 5	1 2 3 4 5
16. The course materials used do not motivate students to study on their own because the language used is too difficult ..	1 2 3 4 5	1 2 3 4 5
17. The course materials used arouse no interest in students ..	1 2 3 4 5	1 2 3 4 5

APPENDIX E (Continued)

Q9

EDUCATION RESEARCH UNIT

RATING THE INNOVATIVENESS OF THE TECHNICAL TEACHERS' TRAINING INSTITUTE CURRICULUM MATERIALS

The aim of this questionnaire is to find out to what extent practising teachers of engineering drawing in Polytechnics consider certain features of the TTTI curriculum materials as "innovative" (ie as a marked departure from existing course materials).

Below are a number of descriptive statements about certain features of the TTTI curriculum materials. Mark every statement by putting a circle around the appropriate number as follows:

1. If the term "innovative" is very applicable to that statement.

2. If the term "innovative" is quite applicable to that statement.

3. If the term "innovative" is slightly applicable to that statement.

4. If the terms "innovative" and "conventional" are not at all applicable to that statement.

5. If the term "CONVENTIONAL" is slightly applicable to that statement.

6. If the term "CONVENTIONAL" is quite applicable to that statement.

7. If the term "CONVENTIONAL" is very applicable to that statement.

OFFICE USE						

1. A wide range of engineering problems are included in the materials	INNOVATIVE	1 2 3 4 5 6 7	CONVENTIONAL
2. The materials provide details of lesson plans	INNOVATIVE	1 2 3 4 5 6 7	CONVENTIONAL
3. The materials include teacher analysis sheets	INNOVATIVE	1 2 3 4 5 6 7	CONVENTIONAL
4. The materials give information about the required depth of treatment for the topics	INNOVATIVE	1 2 3 4 5 6 7	CONVENTIONAL
5. The materials provide test questions	INNOVATIVE	1 2 3 4 5 6 7	CONVENTIONAL
6. The materials provide students with feedback of their own performance	INNOVATIVE	1 2 3 4 5 6 7	CONVENTIONAL
7. The materials state quite clearly what the objective of each topic are	INNOVATIVE	1 2 3 4 5 6 7	CONVENTIONAL
8. The materials include graded exercises for students in every topic	INNOVATIVE	1 2 3 4 5 6 7	CONVENTIONAL

APPENDIX E (Continued)

Q10

EDUCATION RESEARCH UNIT

Reactions to TTTI Materials

The aim of this questionnaire is to find out what instructors/ lecturers who are familiar with the TTTI course materials for Engineering Drawing think of these course materials. The term "TTTI materials" here refers to the teachers' "support materials", the students' "support materials" and such other materials as have been developed by TTTI for the Engineering Drawing (I) course specifically.

Below are a number of statements about these TTTI materials. Please mark each statement according to how much you agree or disagree with it. Put a circle around the appropriate number in the margin on the right. Mark every statement.

1. Strongly agree.
2. Agree.
3. Uncertain/not sure/don't know/irrelevant.
4. Disagree.
5. Strongly disagree.

Please give your personal opinion on these statements. There are no right or wrong responses. Your spontaneous response is what matters. Please work fairly quickly.

OFFICE USE						

1. With these TTTI materials ready at hand I do not need to look for other teaching materials to prepare my lessons	1 2 3 4 5
2. The trouble with having all these TTTI materials is that I feel that I cannot add any information of my own or give exercises of my own	1 2 3 4 5
3. The TTTI materials give me confidence in my teaching	1 2 3 4 5

4. I find it difficult to adopt the teaching methods recommended in the TTTI materials	1 2 3 4 5
5. I am more interested in the suggestions made in the TTTI materials about teaching practices than in the underlying educational principles	1 2 3 4 5
6. I feel that the teaching techniques recommended in the TTTI materials should also be applied to the teaching of the other subjects in the engineering course	1 2 3 4 5
7. Classes in the polytechnics are too big to implement the TTTI curriculum innovation successfully	1 2 3 4 5
8. The TTTI materials are too costly in their present form for polytechnic students	1 2 3 4 5
9. I should be given more preparation time at work in order to make the teaching aids necessary to use the TTTI materials properly	1 2 3 4 5
10. I should have plenty of guidance from TTTI in the preparation of teaching aids, to implement the materials	1 2 3 4 5
11. When I meet with difficulties in using the TTTI materials, I tend to think that it is the fault of the materials rather than my own fault	1 2 3 4 5
12. It's wrong for the TTTI materials to put the same degree of emphasis on drafting skills for all technician students	1 2 3 4 5
13. The TTTI materials seem to be designed to develop the right balance in the skills of reading and preparing actual drawings	1 2 3 4 5
14. The TTTI materials help students to become skilful in the use of engineering drawing instruments	1 2 3 4 5
15. The most innovative aspect of the TTTI materials is their attempt to develop both the abilities of sketching and drawing	1 2 3 4 5
16. The TTTI materials should give practice in the basic skills of engineering drawing through many more exercises	1 2 3 4 5

17. Students should derive the greatest benefit if materials similar to the TTTI materials are prepared for the whole of the three years of the course (in engineering drawing)	1 2 3 4 5
18. The TTTI materials should not be biased towards mechanical engineering	1 2 3 4 5
19. The TTTI materials should show quite distinctly the engineering subject from which each example is taken	1 2 3 4 5
20. Some of the topics dealt with in the TTTI materials are made difficult merely for the sake of using a different teaching technique	1 2 3 4 5
21. The test papers should be attached to the teachers' support materials and <u>not</u> to the students' support materials	1 2 3 4 5
22. The test questions for some of the topics studied in the TTTI materials require additional information often not directly related to the topics	1 2 3 4 5
23. I welcome the multiple-choice type of questions used in the TTTI materials	1 2 3 4 5
24. Students feel that the TTTI materials are so well prepared that they can readily get on with the work in class	1 2 3 4 5
25. Students welcome exercises of the completion type	1 2 3 4 5
26. Students using the TTTI materials do not think of their course in terms of examination success only	1 2 3 4 5
27. I feel that I have been given all the facilities to use the TTTI materials	1 2 3 4 5
(Note: in the following items, the term "Innovators" refers to the TTTI curriculum developers).	
28. Instructors/lecturers who use the TTTI materials should be able to consult the "innovators" often enough	1 2 3 4 5
29. The "innovators" do not encourage a cross-fertilisation of ideas with the teachers who use their materials	1 2 3 4 5

30. The enthusiasm of the "innovators" gives me confidence in following through with their approach to teaching	1 2 3 4 5
31. The "innovators" do not seem concerned with the day-to-day problems of classroom teaching	1 2 3 4 5
32. The only reason why the TTTI materials have prestige value is that these materials are of good quality	1 2 3 4 5

APPENDIX E (Continued)

Q11

EDUCATION RESEARCH UNIT

The aim of this questionnaure is to know your impressions of various aspects of the work situation in the Polytechnic where you teach at present.

Below are a number of statements. Please mark each statement according to how much you agree or disagree with it. Put a circle around the appropriate number in the margin one the right. Mark every statement.

1. Strongly agree.

2. Agree.

3 Uncertain/not sure/don't know/irrelevant.

4. Disagree.

5. Strongly disagree.

OFFICE USE						

1. There can be little action taken until a superior/boss approves a decision	1 2 3 4 5
2. A person who wants to make his own decisions would be quickly discouraged	1 2 3 4 5
3. Even small matters have to be referred to someone higher up for a final answer	1 2 3 4 5
4. I have to ask my superior/boss before I do almost anything	1 2 3 4 5
5. Any decision I make has to have my superior's/boss approval	1 2 3 4 5
6. I have some share in decisions about new practices	1 2 3 4 5
7. I have a part in decisions about new programmes of work	1 2 3 4 5

8. I feel that I am my own boss on most matters	1	2	3	4	5
9. A person can make his own decisions without checking with anyone else..........................	1	2	3	4	5
10. How things are done is left up to the person doing the work	1	2	3	4	5
11. People are allowed to do almost as they please	1	2	3	4	5
12. Most people make their own rules on the job .	1	2	3	4	5
13. Instructors/lecturers are constantly being checked on for rule violations	1	2	3	4	5
14. People feel as though they are being constantly watched, to see that they obey all the rules	1	2	3	4	5

APPENDIX E (Continued)

Q12

EDUCATION RESEARCH UNIT

Please give your PERSONAL OPINION on the statements below. We have tried to cover many different and opposing points of view; you may find yourself agreeing strongly with some of the statements, disagreeing just as strongly with others, and perhaps uncertain about others; whether you agree or disagree with any statement, you can be sure that many people feel the same as you do.

Mark each statement in the right margin according to how much you agree or disagree with it. Please mark every one.

Note that unlike the previous scales, each scale below is a six-point one.

1. I agree very much.
2. I agree on the whole.
3. I agree a little.
4. I disagree a little.
5. I disagree on the whole.
6. I disagree very much.

OFFICE USE						

1. The principles I have come to believe in are quite different from those believed in by most people	1 2 3 4 5 6
2. The highest form of government is a democracy and the highest form of democracy is a government run by those who are most intelligent	1 2 3 4 5 6
3. Even though freedom of speech for all groups is a worthwhile goal, it is unfortunately necessary to restrict the freedon of certain political groups	1 2 3 4 5 6

4. It is only natural that a person would have a much better acquaintance with ideas he believes in than with ideas he opposes	1 2 3 4 5 6
5. Man on his own is a helpless and miserable creature	1 2 3 4 5 6
6. Fundamentally, the world we live in is a pretty lonesome (lonely) place	1 2 3 4 5 6
7. Most people just don't give a "damn" for others (ie just don't care about others)	1 2 3 4 5 6
8. I'd like it if I could find someone who would tell me how to solve my personal problems	1 2 3 4 5 6
9. It is only natural for a person to be rather fearful of the future	1 2 3 4 5 6
10. There is so much to be done and so little time to do it in	1 2 3 4 5 6
11. Once I get wound up in a heated discussion I just can't stop	1 2 3 4 5 6
12. In a discussion I often find it necessary to repeat myself several times to make sure I am being understood	1 2 3 4 5 6
13. In a heated discussion I generally become so absorbed in what I am going to say that I forget to listen to what the others are saying	1 2 3 4 5 6
14. It is better to be a dead hero than to be a live coward	1 2 3 4 5 6
15. While I don't like to admit this even to myself, my secret ambition is to become a great man, like Einstein, or Beethoven, or Shakespeare	1 2 3 4 5 6
16. The main thing in life is for a person to want to do something important	1 2 3 4 5 6
17. If given the chance I would do something of great benefit to the world	1 2 3 4 5 6
18. In the history of mankind there have probably been just a handful of really great thinkers	1 2 3 4 5 6

19. There are a number of people I have come to hate because of the things they stand for	1 2 3 4 5 6
20. A man who does not believe in some great cause has not really lived	1 2 3 4 5 6
21. It is only when a person devotes himself to an ideal or cause that life becomes meaningful	1 2 3 4 5 6
22. Of all the different philosophies which exist in this world there is probably only one which is correct	1 2 3 4 5 6
23. A person who gets enthusiastic about too many causes is likely to be a pretty wishy-washy sort of person	1 2 3 4 5 6
24. To compromise with our political opponents is dangerous because it usually leads to the betrayal of our own side	1 2 3 4 5 6
25. When it comes to differences of opinion in religion we must be careful not to compromise with those who believe differently from the way we do	1 2 3 4 5 6
26. In times like these, a person must be pretty selfish if he considers primarily his own happiness	1 2 3 4 5 6
27. The worst crime a person could commit is to attack publicly the people who believe in the same thing he does	1 2 3 4 5 6
28. In times like these it is often necessary to be more on guard against ideas put out by people or groups in one's camp than by those in the opposing camp	1 2 3 4 5 6
29. A group which tolerates too much differences of opinion among its own members cannot exist for long	1 2 3 4 5 6
30. There are two kinds of people in this world: those who are for the truth and those who are against the truth	1 2 3 4 5 6
31. My blood boils whenever a person stubbornly refuses to admit he's wrong	1 2 3 4 5 6
32. A person who thinks primarily of his own happiness is beneath contempt	1 2 3 4 5 6

33. Most of the ideas which get printed nowadays aren't worth the paper they are printed on	1 2 3 4 5 6
34. In this complicated world of ours the only way we can know what's going on is to rely on leaders or experts who can be trusted	1 2 3 4 5 6
35. It is often desirable to reserve judgement about what is going on until one has had a chance to hear the opinions of those one respects	1 2 3 4 5 6
36. In the long run the best way to live is to pick friends and associates whose tastes and beliefs are the same as one's own	1 2 3 4 5 6
37. The present is all too often full of unhappiness. It is only the future that counts	1 2 3 4 5 6
38. If a man is to accomplish his mission in life it is sometimes necessary to gamble 'all or nothing at all'	1 2 3 4 5 6
39. Unfortunately, a good many people with whom I have discussed important social and moral problems don't really understand what's going on	1 2 3 4 5 6
40. Most people just don't know what's good for them	1 2 3 4 5 6

APPENDIX E (Continued)

Q.13

Recording Sheet for Conversations with the Teachers

Q13.1 Teachers' opinions about the usefulness of the new teaching/learning devices and their preferences.

Special notes

Q13.2 Teachers' opinions about the impact of the innovation on the learning outcomes (eg range of marks).

Special notes

Q13.3 Teachers' opinions about differences between the "model" and actual practice in the implementation of the innovation.

Q13.4 Changes that teachers felt had taken place in their own attitudes towards certain aspects of the innovation.

Q13.5 Teachers' opinions about the organization and the management of the innovation (eg the physical conditions, the material and human resources available, the constraints imposed by the hierarchical structure).

Special notes

APPENDIX E (Continued)

Q.14

Recording Sheet for on-site Observations

On-site observations of the use of the new teaching strategies (eg the use of the TTTI criterion tests, of group activity, of self-instructional materials).	Special notes

APPENDIX E (Continued)

Q15

Code Number	

Introduction

i. Some of the present questionnaires are aimed at finding out your reactions to the present project materials developed for secondary school mathematics. Others are aimed at obtaining your reactions to a number of other issues.

ii. The term "Curriculum (Course) Materials" used in the present questionnaires refers to the text books, teachers' guides, practice exercises, revision exercises and other documents used in the teaching and study of mathematics.

iii. You must not write your name on the questionnaires.

iv. Your responses to the various items in the questionnaires will be treated as strictly confidential. Your responses are required for the purposes of research only. The use of the code numbers is to ensure that all the responses of the one and same person are kept together when recorded.

Many thanks for your assistance. We are indeed most grateful to you for such co-operation.

Q.15

For each of the items below, put a circle around the appropriate number in the column on the right:

1.	Sex	Male	1
		Female	2
2.	Academic Qualification: do you hold a Bachelor's/ Higher degree?	Yes	1
		No	2
3.	Professional Training: are you teacher trained?	Yes	1
		No	2

4. Number of years of teaching in schools and/or other educational institutions.

Less than five years	1
Five to ten years	2
More than ten years	3

5. Please indicate to what extent you are familiar with the present project materials:

Quite unfamiliar (ie you have seen the materials but have never used them in your teaching)	1
Quite familiar (ie you have used some sections of the materials to teach certain topics)	2
Very familiar (ie you have used most if not all the sections of the materials in your teaching) ..	3

6. Type of secondary school in which you teach.

Selective/Grammar/High	1
Non-Selective/Secondary Modern/County Secondary	2
Comprehensive	3
Independent/Public	4
Others (Specify)	5

7. Age .... [ ]

Q.16

APPENDIX E (Continued)

Code Number	

Reactions to Curriculum Innovation

As you probably know, a lot has been said about changing the curriculum for Secondary School children. Sometimes the term used for describing such changes in the curriculum is "curriculum innovation".

The aim of this questionnaire is to find out what practising teachers like yourself think of curriculum changes in secondary school mathematics in particular.

Below are a number of statements about curriculum innovation. Please mark each statement according to how much you agree or disagree with it by putting a circle around the appropriate number in the margin on the right.

The numbers stand for the following:

1. Strongly agree.

2. Agree.

3. Uncertain/not sure/ don't know/irrelevant.

4. Disagree.

5. Strongly disagree.

Mark every statement.
Please give your personal opinion on these statements.
There are no right or wrong responses. Your opinion is what matters.
Please work fairly quickly.

Q.16A (f_1)

1. Secondary school teachers have so much work that they have no time for Curriculum Innovation	1 2 3 4 5
2. Curriculum innovation should be the responsibility of Secondary School teachers	1 2 3 4 5
3. It is for teacher-trainers (lecturers) in universities/colleges to find out what is wrong with the curriculum for secondary school mathematics	1 2 3 4 5
4. It is a waste of time for the secondary school teacher to try new ideas unless his Head of Department approves of them	1 2 3 4 5
5. There is no incentive for the secondary school teacher to initiate curriculum innovation	1 2 3 4 5

Q.16B (f_2)

1. I wish pupils did not have to study such a lot of irrelevant subject matter	1 2 3 4 5
2. Only curriculum innovation will reduce the number of pupils who fail their courses	1 2 3 4 5
3. It is because of the syllabus that teaching is of low standard	1 2 3 4 5
4. Without autonomy in Schools there can be no curriculum innovation	1 2 3 4 5
5. Practising teachers should definitely be involved when new curriculum (course) materials are being written and tried out	1 2 3 4 5
6. Practising mathematicians (eg from industry or commerce) should be involved in planning new courses in secondary school mathematics	1 2 3 4 5

Q.17

APPENDIX E (Continued)

Code Number	

Reactions to New Mathematics (NM) Course Materials

The aim of this questionnaire is to find out how pupils and their teachers react to the NM course materials currently in use for learning and teaching mathematics.

Below are a number of statements about the NM course materials which you are discussing at this conference. Mark each statement according to how much you agree or disagree with it by putting a circle around the appropriate number in the margin on the right.

Mark every statement.

1. Strongly agree.
2. Agree.
3. Uncertain/not sure/don't know/irrelevant.
4. Disagree.
5. Strongly disagree.

Please give your personal opinion on these statements. There are no right or wrong responses. This is not a test of knowledge and ability. Your opinion is what matters. Do not take too much time over each statement.

Q.17A (f_3)

1. The NM materials are written in such a way that they allow the teacher plenty of time for individual help to pupils	1 2 3 4 5
2. For each topic, a number of practice exercises of the completion type are given (ie pupils complete statements, tables and so on)	1 2 3 4 5
3. The NM materials provide pupils with so much information that the teacher does not have to do much formal teaching	1 2 3 4 5
4. The NM materials enable pupils to develop skills in applied mathematics	1 2 3 4 5
5. There is an attempt to relate the topics covered in the NM materials closely to practical, everyday life situations	1 2 3 4 5
6. The exercises are arranged in such a way that pupils do the easy ones first before going on to the difficult exercises	1 2 3 4 5

Q.17B (f_4)

1. The NM materials do not motivate pupils to study on their own because the language used is too difficult	1 2 3 4 5
2. The NM materials contain too many details and pupils get rather confused	1 2 3 4 5
3. The NM materials arouse no interest in pupils	1 2 3 4 5

APPENDIX E (Continued)

Q.18A (f_7)

1. I should be given more preparation time at work in order to make the teaching aids necessary to use the NM materials properly	1 2 3 4 5
2. The revision exercises should be attached to the teachers' support materials and <u>not</u> to the students' support materials ...	1 2 3 4 5
3. Classes in the secondary schools are too big to implement the NM curriculum innovation successfully	1 2 3 4 5
4. The NM materials seem to be designed to develop the right balance of skills in mathematics	1 2 3 4 5
5. Pupils using the NM materials do not think of their course in terms of examination success only	1 2 3 4 5
6. The NM materials help pupils to become skilful in the use of mathematical instruments (set squares, slide rules etc)	1 2 3 4 5
7. I feel that I have been given all the facilities to use the NM materials	1 2 3 4 5
8. The NM materials should not be biased towards motion geometry	1 2 3 4 5
9. The only reason why the NM materials have prestige value is that they are of good quality	1 2 3 4 5
10. Pupils feel that the NM materials are so well prepared that they can readily get on with the work in class	1 2 3 4 5
11. Pupils welcome exercises of the completion type (eg completion of statements, tables, etc)	1 2 3 4 5

Q.18B (f_8)

1. The revision exercises for some of the topics studied in the NM materials require additional information often not directly related to the topics	1 2 3 4 5
2. When I meet with difficulties in using the NM materials, I tend to think that it is the fault of the materials rather than my own fault	1 2 3 4 5
3. I feel that the teaching techniques recommended in the NM materials should also be applied to the teaching of many other subjects in the secondary school curriculum	1 2 3 4 5
4. The NM materials are too costly in their present form	1 2 3 4 5
5. Pupils should derive the greatest benefit if materials similar to the NM materials are prepared for the primary schools as well	1 2 3 4 5
6. The NM materials should give practice in basic mathematical skills through many more exercises	1 2 3 4 5
7. It's wrong for the NM materials to deal with the same topics for all secondary school pupils	1 2 3 4 5
8. Some of the topics dealt with in the NM materials are made difficult merely for the sake of using a different teaching technique	1 2 3 4 5
9. The innovators (ie those who have developed the NM materials) do not seem concerned with the day-to-day problems of classroom teaching	1 2 3 4 5

Q.18C (f_9)

1. I should have plenty of guidance from the NM project in the preparation of teaching aids, to implement the materials	1 2 3 4 5
2. The trouble with having all these NM materials is that I feel that I cannot add any information of my own or give exercises of my own	1 2 3 4 5
3. The NM materials give me confidence in my teaching	1 2 3 4 5

Q.19

APPENDIX E (Continued)

Code Number	

The aim of this questionnaire is to know your impressions of various aspects of the work situation in the school where you teach at present.

Below are a number of statements. Please mark each statement according to how much you agree or disagree with it. Put a circle around the appropriate number in the margin on the right. Mark every statement.

1. Strongly agree.
2. Agree.
3. Uncertain/not sure/don't know/irrelevant.
4. Disagree.
5. Strongly disagree.

---

1. There can be little action taken until a superior/boss approves a decision	1 2 3 4 5
2. A person who wants to make his own decisions would be quickly discouraged	1 2 3 4 5
3. Even small matters have to be referred to someone higher up for a final answer	1 2 3 4 5
4. I have to ask my superior/boss before I do almost anything	1 2 3 4 5
5. Any decision I make has to have my superior's/boss' approval	1 2 3 4 5
6. I have some share in decisions about new practices	1 2 3 4 5
7. I have a part in decisions about new programmes of work	1 2 3 4 5
8. I feel that I am my own boss on most programmes of work	1 2 3 4 5
9. A person can make his own decisions without checking with anyone else	1 2 3 4 5
10. How things are done is left up to the person doing the work	1 2 3 4 5
11. People are allowed to do almost as they please	1 2 3 4 5
12. Most people make their own rules on the job	1 2 3 4 5
13. Instructors/lecturers are constantly being checked on for rule violations	1 2 3 4 5
14. People feel as though they are being constantly watched, to see that they obey all the rules	1 2 3 4 5

Q.20

APPENDIX E (Continued)

Code Number	

Please give your PERSONAL OPINION on the statments below. We have tried to cover many different and opposing points of view; you may find yourself agreeing strongly with some of the statements, disagreeing just as strongly with others, and perhaps uncertain about others; whether you agree or disagree with any statement, you can be sure that many people feel the same as you do.

Mark each statement in the right margin according to how much you agree or disagree with it. Please mark every one.

Note that unlike the previous scales, each scale below is a six-point one.

1. I agree very much.
2. I agree on the whole.
3. I agree a little.
4. I disagree a little.
5. I disagree on the whole.
6. I disagree very much.

---

1. The principles I have come to believe in are quite different from those believed in by most people	1 2 3 4 5 6
2. The highest form of government is a democracy and the highest form of democracy is a government run by those who are most intelligent	1 2 3 4 5 6
3. Even though freedom of speech for all groups is a worthwhile goal, it is unfortunately necessary to restrict the freedom of certain political groups	1 2 3 4 5 6
4. It is only natural that a person would have a much better acquaintance with ideas he believes in than with ideas he opposes	1 2 3 4 5 6
5. Man on his own is a helpless and miserable creature	1 2 3 4 5 6
6. Fundamentally, the world we live in is a pretty lonesome (lonely) place	1 2 3 4 5 6
7. Most people just don't give a "damn" for others (ie just don't care about others)	1 2 3 4 5 6
8. I'd like it if I could find someone who would tell me how to solve my personal problems	1 2 3 4 5 6
9. It is only natural for a person to be rather fearful of the future	1 2 3 4 5 6

10. There is so much to be done and so little time to do it in	1 2 3 4 5 6
11. Once I get wound up in a heated discussion I just can't stop	1 2 3 4 5 6
12. In a discussion I often find it necessary to repeat myself several times to make sure I am being understood	1 2 3 4 5 6
13. In a heated discussion I generally become so absorbed in what I am going to say that I forget to listen to what the others are saying	1 2 3 4 5 6
15. While I don't like to admit this even to myself, my secret ambition is to become a great man, like Einstein, or Beethoven, or Shakespeare	1 2 3 4 5 6
16. The main thing in life is for a person to want to do something important	1 2 3 4 5 6
17. If given the chance I would do something of great benefit to the world	1 2 3 4 5 6
18. In the history of mankind there have probably been just a handful of really great thinkers	1 2 3 4 5 6
19. There are a number of people I have come to hate because of the things they stand for	1 2 3 4 5 6
20. A man who does not believe in some great cause has not really lived	1 2 3 4 5 6
21. It is only when a person devotes himself to an ideal or cause that life becomes meaningful	1 2 3 4 5 6
22. Of all the different philosophies which exist in this world there is probably only one which is correct	1 2 3 4 5 6
23. A person who gets enthusiastic about too many causes is likely to be a pretty wishy-washy sort of person	1 2 3 4 5 6
24. To compromise with our political opponents is dangerous because it usually leads to the betrayal of our own side	1 2 3 4 5 6
25. When it comes to differences of opinion in religion we must be careful not to compromise with those who believe differently from the way we do	1 2 3 4 5 6

26. In times like these, a person must be pretty selfish if he considers primarily his own happiness	1 2 3 4 5 6
27. The worst crime a person could commit is to attack publicly the people who believe in the same thing he does	1 2 3 4 5 6
28. In times like these it is often necessary to be more on guard against ideas put out by people or groups in one's camp than by those in the opposing camp	1 2 3 4 5 6
29. A group which tolerates too much differences of opinion among its own members cannot exist for long	1 2 3 4 5 6
30. There are two kinds of people in this world: those who are for the truth and those who are against the truth	1 2 3 4 5 6
31. My blood boils whenever a person stubbornly refuses to admit he's wrong	1 2 3 4 5 6
32. A person who thinks primarily of his own happiness is beneath contempt	1 2 3 4 5 6
33. Most of the ideas which get printed nowadays aren't worth the paper they are printed on	1 2 3 4 5 6
34. In this complicated world of ours the only way we can know what's going on is to rely on leaders or experts who can be trusted	1 2 3 4 5 6
35. It is often desirable to reserve judgement about what is going on until one has had a chance to hear the opinions of those one respects	1 2 3 4 5 6
36. In the long run the best way to live is to pick friends and associates whose tastes and beliefs are the same as one's own	1 2 3 4 5 6
37. The present is all too often full of unhappiness. It is only the future that counts	1 2 3 4 5 6
38. If a man is to accomplish his mission in life it is sometimes necessary to gamble 'all or nothing at all'	1 2 3 4 5 6
39. Unfortunately, a good many people with whom I have discussed important social and moral problems don't really understand what's going on	1 2 3 4 5 6
40. Most people just don't know what's good for them	1 2 3 4 5 6

Q21

APPENDIX E (Continued)

Code Number

EYSENCK PERSONALITY INVENTORY

by H. J. Eysenck and Sybil B. G. Eysenck

PERSONALITY QUESTIONNAIRE

FORM A

NAME.....Leave blank........................ AGE...Leave blank

OCCUPATION.....Leave blank................. SEX...............

N= ☐ E= ☐ L= ☐

Instructions

Here are some questions regarding the way you behave, feel and act. After each question is a space for answering "YES" or "NO".

Try to decide whether "YES" or "NO" represents your usual way of acting or feeling. Then put a cross in the circle under the column headed "YES" or "NO". Work quickly, and don't spend too much time over any question; we want your first reaction, not a long-drawn out thought process. The whole questionnaire shouldn't take more than a few minutes. Be sure not to omit any questions.

Now turn the page over and go ahead. Work quickly, and remember to answer every question. There are no right or wrong answers, and this isn't a test of intelligence or ability, but simply a measure of the way you behave.

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E ◯ N ◯ L ◯

FORM A

		YES	NO
1.	Do you often long for excitement?	◯	◯
2.	Do you often need understanding friends to cheer you up?	◯	◯
3.	Are you usually carefree?	◯	◯
4.	Do you find it very hard to take no for an answer?	◯	◯
5.	Do you stop and think things over before doing anything?	◯	◯
6.	If you say you will do something do you always keep your promise, no matter how inconvenient it might be to do so?	◯	◯
7.	Does your mood often go up and down?	◯	◯
8.	Do you generally do and say things quickly without stopping to think?	◯	◯
9.	Do you ever feel "just miserable" for no good reason?	◯	◯
10.	Would you do almost anything for a dare?	◯	◯
11.	Do you suddenly feel shy when you want to talk to an attractive stranger?	◯	◯
12.	Once in a while do you lose your temper and get angry?	◯	◯
13.	Do you often do things on the spur of the moment?	◯	◯
14.	Do you often worry about things you should not have done or said?	◯	◯
15.	Generally, do you prefer reading to meeting people?	◯	◯
16.	Are your feelings rather easily hurt?	◯	◯
17.	Do you like going out a lot?	◯	◯
18.	Do you occasionally have thoughts and ideas that you would not like other people to know about?	◯	◯
19.	Are you sometimes bubbling over with energy and sometimes very sluggish?	◯	◯
20.	Do you prefer to have few but special friends?	◯	◯
21.	Do you daydream a lot?	◯	◯
22.	When people shout at you, do you shout back?	◯	◯
23.	Are you often troubled about feelings of guilt?	◯	◯
24.	Are *all* your habits good and desirable ones?	◯	◯
25.	Can you usually let yourself go and enjoy yourself a lot at a lively party?	◯	◯
26.	Would you call yourself tense or "highly-strung"?	◯	◯
27.	Do other people think of you as being very lively?	◯	◯

	YES	NO
28. After you have done something important, do you often come away feeling you could have done better?	○	○
29. Are you mostly quiet when you are with other people?	○	○
30. Do you sometimes gossip?	○	○
31. Do ideas run through your head so that you cannot sleep?	○	○
32. If there is something you want to know about, would you rather look it up in a book than talk to someone about it?	○	○
33. Do you get palpitations or thumping in your heart?	○	○
34. Do you like the kind of work that you need to pay close attention to?	○	○
35. Do you get attacks of shaking or trembling?	○	○
36. Would you always declare *everything* at the customs, even if you knew that you could never be found out?	○	○
37. Do you hate being with a crowd who play jokes on one another?	○	○
38. Are you an irritable person?	○	○
39. Do you like doing things in which you have to act quickly?	○	○
40. Do you worry about awful things that might happen?	○	○
41. Are you slow and unhurried in the way you move?	○	○
42. Have you ever been late for an appointment or work?	○	○
43. Do you have many nightmares?	○	○
44. Do you like talking to people so much that you never miss a chance of talking to a stranger?	○	○
45. Are you troubled by aches and pains?	○	○
46. Would you be very unhappy if you could not see lots of people most of the time?	○	○
47. Would you call yourself a nervous person?	○	○
48. Of all the people you know, are there some whom you definitely do not like?	○	○
49. Would you say that you were fairly self-confident?	○	○
50. Are you easily hurt when people find fault with you or your work?	○	○
51. Do you find it hard to really enjoy yourself at a lively party?	○	○
52. Are you troubled with feelings of inferiority?	○	○
53. Can you easily get some life into a rather dull party?	○	○
54. Do you sometimes talk about things you know nothing about?	○	○
55. Do you worry about your health?	○	○
56. Do you like playing pranks on others?	○	○
57. Do you suffer from sleeplessness?	○	○

PLEASE CHECK TO SEE THAT YOU HAVE ANSWERED *ALL* THE QUESTIONS

Q.22

APPENDIX E (Continued)

Code Number	

Below are a number of statements which people make concerning themselves. Please mark each statement according to how much you agree or disagree that it applies to you. Put a circle around the appropriate number in the margin on the right. Mark every statement.

1. Strongly agree.
2. Agree.
3. Uncertain/not sure/don't know/irrelevant.
4. Disagree.
5. Strongly disagree.

---

1. I am often the last one to give up trying to do a thing	1 2 3 4 5
2. There is usually only one best way to solve most problems	1 2 3 4 5
3. I prefer work that requires a great deal of attention to detail	1 2 3 4 5
4. I often become so wrapped up in something I am doing that I find it difficult to turn my attention to other matters	1 2 3 4 5
5. I dislike to change my plans in the midst of an undertaking	1 2 3 4 5
6. I never miss going to church	1 2 3 4 5
7. I usually maintain my own opinions even though many other people may have a different point of view	1 2 3 4 5
8. I find it easy to stick to a certain schedule, once I have started it	1 2 3 4 5
9. I do not enjoy having to adapt myself to new and unusual situations	1 2 3 4 5
10. I prefer to stop and think before I act even on trifling matters	1 2 3 4 5
11. I try to follow a program of life based on duty	1 2 3 4 5
12. I usually find that my own way of attacking a problem is best, even though it doesn't always seem to work in the beginning	1 2 3 4 5

13. I am a methodical person in whatever I do	1 2 3 4 5
14. I think it is usually wise to do things in a conventional way	1 2 3 4 5
15. I always finish tasks I start, even if they are not very important	1 2 3 4 5
16. I often find myself thinking of the same tunes or phrases for days at a time	1 2 3 4 5
17. I have a work and study schedule which I follow carefully	1 2 3 4 5
18. I usually check more than once to be sure that I have locked a door, put out the light, or something of the sort	1 2 3 4 5
19. I have never done anything dangerous for the thrill of it	1 2 3 4 5
20. I believe that promptness is a very important personality characteristic	1 2 3 4 5
21. I am always careful about my manner of dress	1 2 3 4 5
22. I always put on and take off my clothes in the same order	1 2 3 4 5

APPENDIX E (Continued)

The arrangement of item content within the different sections of the questionnaire about curriculum innovation in Engineering Drawing

SECTION (Q7)

Item Number	Item Content
1	Welcome for curriculum innovation in general.
2	The need for curriculum innovation.
3, 4, 5	The reasons for curriculum innovation: irrelevant subject matter, failure rate, bad teaching.
6, 7, 8, 9	The reasons for difficulties in implementing curriculum innovation: no academic freedom, no responsibility for the initiation of curriculum development, lack of additional resources, lack of time.
10, 11, 12, 13, 14, 15	Who should be involved in curriculum innovation: Polytechnic teachers, teacher trainers, Polytechnic teachers for writing and trying out materials only, students, practising engineers?
16, 17	The motivation for curriculum innovation: there is no motivation without the HOD's approval, there is no incentive.

SECTION (Q8)

Item Number	Item Content
1	The relationship of the curriculum content to industrial drawings
2	The understanding of principles
3	The development of practical skills
4	The individual help given to students
5	The amount of lecturing
6	The difficulty level of the course materials
7	The amount of details in the course materials
8	Students' discussions with teachers
9, 10, 11	The type of exercises
12	The relevance to jobs in industry
13	The application of principles
14	The understanding of component parts
15	The guidance given by teachers
16, 17	The motivation to study

SECTION (Q9)

Item Number	Item Content
1 to 8	The innovativeness of the following features: the range of engineering problems, the details of lesson plans, the teacher analysis sheets, the depth of treatment, the test questions, the feedback of students' performance, the objectives of each topic, the graded exercises.

SECTION (Q10)

Item Number	Item.Content
1, 2, 3, 4, 5, 6	The new teaching method and its applicability
7, 8, 9, 10, 11	The difficulties in implementing the new materials (class size, cost, time for preparing aids, lack of guidance)
12, 13, 14, 15, 16, 17, 18, 19, 20	The skills content and the knowledge content of the new curriculum materials
21, 22, 23	The new testing procedures
24, 25	The novel student-centred activites
26	The importance of examination success
27	The available facilities
28, 29, 30, 31, 32	The teachers' perceptions of the RESOURCE SUB-SYSTEM

APPENDIX E

A COMPARATIVE LIST OF THE STRUCTURED QUESTIONNAIRES AND VARIABLES USED IN THE EMPIRICAL INVESTIGATIONS IN INDIA AND IN ENGLAND, RESPECTIVELY

		THE QUESTIONNAIRES																									
		Q6										Q7		Q8		Q9		Q10					Q11	Q12	-	-	-
		BACKGROUND INFORMATION VARIABLES								KNOWLEDGE OF INNOVATION VARIABLES		Intervening variables (I:V) (First-level factors of attitude)									Hypothetical constructs (H:C) (second-level factors of attitude)		Organization Variable	PERSONALITY variables			
Stage A.		Age	Sex	Academic Qualification	Type of Polytechnic	Size of Polytechnic	Present Position	Teaching Experience	Professional Training	FAMILIARITY	Attendance on a course	7A (f_1)	7B (f_2)	8A (f_3)	8B (f_4)	9A (f_5)	9B (f_6)	10A (f_7)	10B (f_8)	10C (f_9)	F_A & F'_A	F_B & F'_B	Experience of Bureaucracy	Dogmatism	Extraversion	Neuroticism	Rigidity
		-	-	-	Q6.A	Q6.B	Q5.1	Q6.2	Q6.3	Q6.4	Q6.5																
The Study in India	Study of the FAMILIAR teachers in TAMIL NADU	-	-	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	-	-
	Study of the NON-FAMILIAR SAMPLE in the OTHER STATES	-	-	-	✓	✓	✓	✓	✓	✓	✓	✓		-	-	-	-	-	-	-	-	-	✓	✓	-	-	-

		Q.15										Q16		Q17				Q18					Q19	Q20	Q21E	Q21N	Q22
Stage B.		Age	Sex	Academic Qualification	Type of School	Size of School	Present Position	Teaching Experience	Professional Training	FAMILIARITY	Attendance on a course	Intervening Variables (I:V)									Hypothetical constructs (H:C)		Experience of Bureaucracy	Dogmatism	Extraversion	Neuroticism	Rigidity
		Q15.7	Q15.1	Q15.2	Q15.6	-	-	Q15.4	Q15.3	Q15.5	-	16A (f_1)	16B (f_2)	17A (f_3)	17B (f_4)	-	-	18A (f_7)	18B (f_8)	18C (f_9)	EF_A & EF'_A	EF_B & EF'_B					
The Study in England	The Replication Study	✓	✓	✓	✓	-	-	✓	✓	✓	*	✓	-	-	✓	-	-	✓	✓	✓	✓	✓	✓	✓	-	-	-
	The Extension Study	✓	✓	✓	✓	-	-	✓	✓	✓	*	-	-	-	-	-	-	-	-	-	✓	✓	✓	✓	✓	✓	✓

* All respondents in the ENGLISH SAMPLE were attending a course

✓ = variables included in a particular study
- = variables not included in a particular study

Note: Columns in the same vertical line represented the same variable although the coding varied for the different studies (eg. 7A and 16A were composed of the same items)

APPENDIX E (Continued)

A FEW RELEVANT ADDITIONAL NOTES ABOUT THE EYSENCK PERSONALITY INVENTORY AND ABOUT THE RIGIDITY SCALE USED IN THE PRESENT STUDY

A. The Eysenck Personality Inventory (Eysenck and Eysenck, 1971) (Form A): The Means and standard deviations of scores for the group of teachers in the standardization sample.

The scoring procedures for the inventory was as described in the manual. Each item was scored 1 or 0.

	Maximum Possible Score	Minimum Possible Score
The Neuroticism Scale (N)	24	0
The Extraversion Scale (E)	24	0
The Lie Scale (L)	9	0

From the following table, it can be seen that there were no significant differences between the Standardization sample and our ENGLISH SAMPLE. (Note: For the LIE SCALE, (a) the standardization sample included subjects other than teachers and (b) our sample included the eight teachers with a lie score greater than 5 giving a total sample of 90).

	Neuroticism Scale			Extraversion Scale			Lie Scale		
	n	M	SD	n	M	SD	n	M	SD
Standardization Sample	42	9.904	4.232	42	10.762	4.206	651	2.263	1.572
ENGLISH SAMPLE	82	10.121	5.169	82	10.365	3.713	90	2.522	1.424
't' between the two samples	.251 (ns)			-.517 (ns)			1.622 (ns)		

B. Gough's Rigidity Scale (1952; 1960)

The following notes were written after our research into the development of the scale and our private correspondence with the Consulting Psychologists Press (Palo Alto, California) and with Professor M Rokeach (Washington state University).

In his book "The Open and Closed Mind", Rokeach (1960) referred in Chapter 9 to the "22-item Gough-Sanford Rigidity Scale". He listed in Appendix C of the book the 22 items with a footnote that the scale was included in the California Psychological Inventory and labelled Flexibility. Earlier in 1955, in his article on "The distinction between Dogmatic and Rigid Thinking" in the Journal of Abnormal and Social Psychology (Volume 51, pages 87-93), Rokeach and his co-authors had made reference to a 22-item Rigidity scale devised by Gough and Sanford. However, in a foot-note of that same article (page 89), the authors listed three sample items which did not belong to the scale quoted in Rokeach's book "The Open and Closed Mind". On closer examination, we found that the 22 items in Rokeach's book were not at all the same as the 22 items of the Gough-Sanford Rigidity scale which were included in the California Psychological Inventory and labelled "Flexibility"!

Professor Rokeach's explanation to us was brief. It was that the Rigidity Scale had "undergone a series of revisions" from the time he had first published on it in the Journal of Abnormal and Social Psychology in 1955 and the time he published the same scale in his book, The Open and Closed Mind.

The Consulting Psychologists Press provided us with a detailed explanation of the history of the revisions which the Rigidity Scale had undergone. They made moreover two pertinent points in relation to the present study. Firstly, it appeared that "from unpublished studies" the version of the scale given by Rokeach (1960) in his book, "The Open and Closed Mind", correlated "very highly" with the 22 items of the Gough-Sanford scale, "so that the psychometric and psychological properties of the two scales" were "very similar". Secondly, they advised that if we were using Rokeach's scale for Dogmatism and wanted to tie our research to his book, it would seem that we should also use the version of the Rigidity scale, published in "The Open and Closed Mind". This is what in fact we did as we explain in the text.

No norms for teachers in England were available for this particular Rigidity Scale; comparisons with other samples were therefore not possible. In order to retain the same format as for most of our other questionnaires we used a five-point scale for scoring each item. But for the Gough-Sanford Scale each item was scored as true or false.

APPENDIX E (Continued)

The Experience of Bureaucracy Scale (Aiken and Hage, 1966)

The scale was made up of four organisational indices as follows:

1. An index of hierarchy of authority (items 1 to 5). This showed the extent of reliance upon supervisors in making decisions about individually assigned tasks.

2. An index of participation in decision making (item 6 and 7). This reflected the relative degrees of participation in decisions affecting the entire organisation such as those involving the adoption of new policies.

3. An index of job codification (items 8 to 12). This referred to the degree to which job incumbents had to consult rules in fulfilling professional responsibilities.

4. An index of rule observation (items 13, 14). This referred to the degree to which employees were observed for rule violation.

APPENDIX F

THE ESTIMATED POPULATION OF TEACHERS OF ENGINEERING DRAWING IN THE POLYTECHNICS OF SOUTH INDIA (ie. IN THE STATES OF TAMIL NADU, MYSORE, KERALA AND ANDHRA PRADESH)

A. It was not possible for us in the time allocated for the research to obtain the precise list of teachers teaching Engineering Drawing in the Polytechnics of South India because of the constantly changing pattern of staff organization; we could only make an estimate of the teaching population for Engineering Drawing on the basis of the information that was available to us.

The sub-population of teachers in the state of TAMIL NADU

There were 24 Polytechnics in TAMIL NADU where Engineering was taught to male students; it was estimated that there was an average of 4 teachers per Polytechnic teaching Engineering Drawing; the sub-population consisted therefore of 96 teachers approximately. Of these, 30 had attended a CRASH COURSE at TTTI.

The sub-population of teachers in the OTHER STATES (Mysore, Kerala, Andhra Pradesh)

There were 58 comparable Polytechnics in the other three states (Mysore: 25; Kerala: 14; Andhra Pradesh: 19.) Consequently, the number of teachers in that sub-population was 232 approximately, assuming again an average of 4 teachers per Polytechnic. Of these, 40 had attended a CRASH COURSE at TTTI. Furthermore, the state of Andhra Pradesh had seconded one teacher of Engineering Drawing from each of its 19 Polytechnics for a CRASH COURSE at the TTTI; assuming that such a teacher became subsequently an agent for the diffusion of the innovation to the other three teachers in his team in his Polytechnic, it followed that another 57 teachers (3 x 19) had probably some degree of FAMILIARITY with the innovation.

In Section B overleaf is tabulated the estimated number of teachers by State and by Attendance on CRASH COURSES.

B. The estimated population of teachers of Engineering Drawing by State and by Attendance on CRASH COURSE

		STATE	
		TAMIL NADU (FAMILIAR teachers)	OTHER STATES (Mysore, Kerala, Andhra Pradesh) NON-FAMILIAR
Attendance on CRASH COURSE	Attended	30	40
	Did not attend	66	192*
TOTAL		96	232
		328	

* Of these, 57 (from Andhra Pradesh) had some FAMILIARITY with the innovative materials through working with these materials, that is, using them in their own teaching.

APPENDIX F (Continued)

Classification of the respondents in India by FAMILIARITY and by ATTENDANCE on a CRASH COURSE

(the number of respondents in each cell was based on the completed questionnaires that were returned to us)

		Attendance on a Course			
		Yes		No	
		TAMIL NADU teachers (FAMILIAR teachers)	Teachers in the OTHER STATES of South India (NON-FAMILIAR teachers)	TAMIL NADU teachers (FAMILIAR teachers)	Teachers in the OTHER STATES of South India (NON-FAMILIAR teachers)
FAMILIARITY	Very Unfamiliar	-	-	-	30
	Quite Unfamiliar	-	4	-	24
	Quite Familiar	8	5	35	17
	Very Familiar	16	-	21	-
	TOTAL	24	9	56	71

NOTE:- Those who attended a course about a particular curriculum innovation were considered to be FAMILIAR with it when analysing the data; hence only the 54 teachers in the OTHER STATES were truly in the category of NON-FAMILIAR teachers; they made up the MAJOR NON-FAMILIAR SAMPLE.

APPENDIX G

The Raw Scores for the Teachers in

SOUTH INDIA

APPENDIX G

RAW SCORES for the MAIN FAMILIAR SAMPLE (n=80)

1011
Q6. 2 3 1 2 2 3 2
Q7. 2 1 4 3 5 3 2 1 2 2 2 1 1 1 4 4 2
Q8CT. 1 1 1 1 2 2 3 1 2 3 2 4 3 4 4 4 4
Q8TT. 1 1 1 1 3 1 2 1 2 1 2 4 4 4 4 4 4
Q9. 1 1 2 2 3 2 2 1
Q10. 4 4 2 4 2 3 2 4 2 2 4 4 2 1 1 2 4 4 2 3 3 4 2 1 1 1 2 2 3 2 4 2
Q11. 1 4 2 1 1 2 2 4 4 2 4 3 3 2
Q12. 4 2 1 3 6 6 2 1 3 1 3 2 5 1 5 1 1 2 3 1 1 2 3 1 1 5 1 3 2 1 3
3 4 2 1 3 1 3 2 2

1021
Q6. 2 3 1 2 2 3 2
Q7. 2 1 4 5 1 2 4 2 4 3 2 1 4 1 1 4 3
Q8CT. 2 1 1 1 1 1 2 4 1 3 3 1 1 5 2 2 1
Q8TT. 2 3 2 2 1 1 2 1 2 1 4 2 4 4 1 1 4
Q9. 4 3 2 5 6 4 2 3
Q10. 5 2 1 2 2 1 1 5 1 1 5 2 1 1 2 1 1 2 1 2 2 2 1 1 1 4 1 2 4 2 2 1
Q11. 2 2 4 4 2 2 1 4 3 2 4 4 2 2
Q12. 2 1 2 2 1 4 1 6 1 3 5 2 2 1 1 1 2 3 2 2 4 6 3 1 1 5 1 1 1 1 1
1 1 3 1 6 1 1 1 1

1031
Q6. 2 3 3 3 1 4 1
Q7. 1 1 2 3 3 4 4 2 2 4 2 1 5 2 4 4 1
Q8CT. 3 3 4 4 4 3 2 4 2 4 4 4 2 1 2 3 4
Q8TT. 2 1 2 2 2 2 4 2 2 1 4 4 4 5 4 5 5
Q9. 2 2 1 1 1 1 1 1
Q10. 4 4 2 4 2 2 1 5 2 2 3 3 1 1 1 1 1 2 3 4 2 3 1 1 2 3 2 2 4 2 4 3
Q11. 1 3 2 2 2 2 2 3 3 4 4 4 4 3
Q12. 5 2 3 2 6 4 5 3 2 2 4 5 5 5 3 1 1 1 3 2 1 1 2 3 3 3 3 2 2 1 2
2 2 2 3 3 3 4 3 2

1041
Q6. 1 4 5 3 2 4 2
Q7. 1 1 2 3 4 3 4 2 2 4 3 1 4 2 2 4 2
Q8CT. 3 2 3 3 3 3 3 3 4 3 3 3 3 3 3 3 3
Q8TT. 2 2 1 2 2 2 4 3 2 2 3 4 4 4 4 4 4
Q9. 2 1 2 2 4 6 1 2
Q10. 4 5 2 4 4 2 1 4 2 3 4 4 2 2 1 3 1 4 3 4 2 2 2 4 2 3 5 2 4 1 3 4
Q11. 2 2 2 4 2 2 2 4 3 2 4 3 3 3
Q12. 1 2 3 2 3 5 3 3 5 5 5 3 5 3 2 2 2 2 3 2 2 3 2 2 5 5 1 1 2 2 3
3 5 5 2 2 3 3 2 4

1051
Q6. 2 3 1 2 2 4 2
Q7. 1 1 4 1 5 2 3 2 4 1 4 2 4 1 5 5 5
Q8CT. 3 4 4 3 4 3 3 3 4 3 3 3 2 4 2 4 4
Q8TT. 1 1 2 1 1 2 4 2 1 1 1 4 4 4 1 4 4
Q9. 1 1 1 1 1 1 1 1
Q10. 2 2 2 4 2 1 4 4 2 4 4 3 2 2 1 2 1 4 2 2 4 4 2 2 2 2 2 1 2 2 4 2
Q11. 4 2 3 1 1 1 1 5 4 3 4 2 4 2
Q12. 2 3 3 3 1 2 3 3 1 3 2 2 2 1 2 1 1 2 3 2 2 2 2 3 2 3 4 3 3 1 2
1 2 3 2 3 2 3 3 3

1061
Q6. 2 3 1 3 2 3 2
Q7. 2 1 1 1 4 2 2 2 2 2 2 2 1 1 2 4 3
Q8OT. 2 1 3 3 3 4 2 2 3 3 3 3 3 3 3 3 3
Q8TT. 2 1 5 5 5 3 2 2 5 2 2 4 4 2 4 2 4
Q9. 1 6 7 6 1 1 6 1
Q10. 3 4 2 4 2 2 4 4 4 2 4 4 2 2 2 2 5 4 4 2 2 2 1 2 2 4 2 2 4 2 4 1
Q11. 4 4 4 4 4 2 2 4 2 4 2 4 2 2
Q12. 1 1 1 1 1 6 1 1 3 3 3 4 5 5 1 2 2 1 1 1 1 1 1 3 1 1 1 1 6 3 4
1 1 3 1 1 4 4 3 1

1081
Q6. 2 3 5 3 1 4 2
Q7. 1 2 2 2 4 2 2 2 2 3 2 1 2 2 3 1 2
Q8OT. 2 2 3 4 4 3 4 3 2 2 3 2 2 3 3 1 2
Q8TT. 1 1 2 1 2 2 3 1 1 1 4 4 4 4 3 2 4
Q9. 3 3 2 1 2 2 2 2
Q10. 2 4 1 2 4 2 1 2 1 2 3 4 2 2 2 2 1 1 2 4 1 2 2 2 2 4 4 2 4 3 3 2
Q11. 2 2 3 4 2 2 2 4 4 4 5 3 2 2
Q12. 2 2 2 1 2 5 3 2 2 2 3 3 3 2 2 2 3 2 3 3 2 5 2 2 3 4 2 4 2 2 4
4 3 2 2 2 4 4 4 3

1091
Q6. 2 3 3 3 1 3 2
Q7. 2 2 1 2 2 3 4 1 4 2 4 1 4 1 4 1 2
Q8CT. 2 2 2 4 4 2 2 2 4 2 4 4 4 4 5 2 2
Q8TT. 1 2 2 2 4 4 4 2 2 1 2 3 4 3 5 4 4
Q9. 1 2 2 3 2 2 1 2
Q10. 2 5 3 5 2 2 2 5 2 2 3 4 2 1 1 2 1 3 2 4 1 4 1 2 2 3 4 4 4 2 3 2
Q11. 2 4 2 2 2 3 3 5 4 4 3 2 2 2
Q12. 3 5 3 3 2 2 2 3 3 3 4 5 5 4 2 1 2 4 2 2 1 5 4 3 3 2 5 3 3 1 3
4 3 3 2 3 2 3 3 4

1101
Q6. 1 3 3 3 2 4 1
Q7. 1 1 2 3 2 2 2 2 1 2 3 2 3 1 1 1 1
Q8OT. 3 3 2 2 3 3 3 2 2 2 3 3 3 2 3 3 3
Q8TT. 2 1 1 2 1 2 4 4 2 1 2 3 4 4 4 4 4
Q9. 2 2 1 2 2 3 2 2
Q10. 1 4 2 4 2 2 1 1 2 4 4 3 2 2 2 2 2 1 2 3 1 2 2 2 3 3 2 2 4 2 2 2
Q11. 2 4 2 3 2 3 3 3 3 2 2 3 2 4
Q12. 5 1 2 2 4 4 5 3 2 2 3 3 5 2 2 1 2 3 3 3 1 3 3 2 3 1 2 3 2 2 2
2 3 2 2 2 4 2 2 2

1111
Q6. 1 3 5 3 1 3 2
Q7. 1 2 2 3 4 4 2 1 1 2 3 2 5 1 2 2 2
Q8OT. 2 3 3 3 3 3 4 3 2 3 3 2 2 4 4 4 3
Q8TT. 1 1 2 2 3 3 4 2 1 2 2 4 4 4 4 5 3
Q9. 2 2 2 4 2 2 2 3
Q10. 2 4 4 4 2 2 1 2 2 4 4 3 2 2 2 3 1 1 2 4 1 2 2 2 3 4 2 1 3 2 3 2
Q11. 2 1 2 2 2 2 2 4 4 4 4 2 2 2
Q12. 3 2 1 2 5 5 2 3 2 3 2 3 2 3 3 3 3 1 2 1 1 5 3 2 5 2 2 2 3 1 1
1 4 2 2 1 2 3 1 1

1121
Q6. 1 4 3 2 2 4 1
Q7. 1 1 5 1 5 5 4 1 5 2 1 2 2 1 1 5 4
Q8OT. 5 4 5 4 5 4 2 5 5 5 5 1 2 1 2 3 2
Q8TT. 2 1 1 1 2 2 4 2 1 1 2 5 4 5 5 5 5
Q9. 2 1 1 2 1 1 2 1
Q10. 1 4 1 5 1 1 5 5 4 2 4 5 1 1 1 4 1 4 4 4 5 4 1 1 1 1 1 4 4 4 4 1
Q11. 4 5 5 5 5 2 2 2 5 2 2 4 2 4
Q12. 1 4 1 1 6 6 5 6 6 2 6 5 6 1 1 1 1 1 5 4 1 6 5 6 6 6 2 1 6 2 4
6 6 1 2 5 5 6 6 6

1141
Q6. 2 3 2 2 2 3 1
Q7. 2 1 5 2 4 3 4 2 2 3 4 2 2 2 2 2 2
Q8OT. 3 2 4 4 4 2 4 2 4 4 4 2 2 2 2 2 3
Q8TT. 1 2 2 2 2 2 2 2 1 1 2 4 4 4 4 4 4
Q9. 1 1 1 1 1 1 1 1
Q10. 2 4 2 4 3 2 4 4 4 2 4 3 3 3 2 2 2 4 2 4 4 2 2 2 2 4 2 4 2 2 4 4
Q11. 3 3 3 4 3 2 2 4 4 4 4 2 2 2
Q12. 2 3 3 3 2 3 2 3 3 5 5 4 4 2 5 4 2 3 3 3 3 3 4 3 3 4 5 4 3 2 3
4 3 3 3 3 4 4 2 3

1151
Q6. 2 3 3 1 2 4 1
Q7. 1 1 4 3 4 2 2 1 4 2 4 1 4 2 5 2 3
Q8OT. 4 3 4 4 4 3 4 4 2 3 3 2 2 4 3 1 3
Q8TT. 2 2 2 2 2 2 4 2 1 1 2 4 4 4 4 5 4
Q9. 2 2 1 2 6 2 1 2
Q10. 2 4 2 4 2 2 2 4 1 2 4 4 2 2 2 4 1 3 2 4 2 4 2 2 2 3 1 2 4 2 2 4
Q11. 4 4 4 4 4 1 2 4 3 4 3 2 2 4
Q12. 2 2 1 5 6 6 3 6 4 5 5 5 5 6 6 1 3 4 5 2 2 2 5 2 2 2 1 2 2 1 2
2 5 5 5 3 5 5 5 3

1161
Q6. 2 3 3 3 3 2 4
Q7. 1 2 2 2 3 2 2 2 2 2 2 1 2 1 2 2 1
Q8OT. 3 4 4 3 3 3 3 3 2 3 2 3 3 3 3 2 2
Q8TT. 1 1 1 2 3 3 3 1 1 2 2 3 3 3 3 4 4
Q9. 1 1 2 2 1 3 1 2
Q10. 1 2 3 4 2 2 1 4 1 2 3 2 1 1 1 1 2 2 2 3 2 3 1 1 1 2 1 2 3 2 3 2
Q11. 2 5 4 2 2 2 3 2 4 3 2 2 3 2
Q12. 3 2 1 3 5 4 1 1 2 2 3 2 3 3 3 2 1 1 1 2 3 2 3 2 3 1 2 3 2 1 2
2 1 3 3 3 2 3 2 1

1171
Q6. 2 3 2 2 2 3 2
Q7. 1 2 2 3 4 2 2 2 2 3 4 2 1 2 2 1 2
Q8OT. 2 2 2 2 3 3 2 3 2 3 3 3 2 3 4 2 2
Q8TT. 2 1 1 2 1 2 4 2 1 1 2 4 4 5 4 5 1
Q9. 2 2 3 1 2 2 2 2
Q10. 2 4 2 4 2 2 2 4 1 2 4 3 2 2 2 4 2 2 4 4 4 4 4 2 1 1 4 2 4 2 4 2
Q11. 2 2 2 4 2 2 2 4 4 2 2 4 4 2
Q12. 5 3 2 2 3 5 3 3 2 2 4 4 5 4 4 2 4 2 2 2 2 4 3 3 2 2 3 3 2 1 1
2 4 2 2 2 3 3 2 2

1181
Q6. 2 3 8 3 2 3 2
Q7. 1 1 3 3 4 5 2 5 5 1 3 1 4 1 1 5 4
Q8OT. 1 2 2 3 2 3 4 2 1 2 2 4 2 4 4 4 3
Q8TT. 2 3 2 3 2 3 4 3 2 2 2 4 4 4 4 4 4
Q9. 3 4 3 5 3 5 3 3
Q10. 3 5 4 4 5 2 4 4 2 5 3 4 2 3 2 3 1 1 3 5 4 4 2 3 3 4 1 2 3 3 3 4
Q11. 5 5 5 5 5 2 2 2 4 2 4 4 5 4
Q12. 5 2 3 2 3 6 6 5 3 5 5 4 6 4 4 3 4 1 5 2 3 5 4 4 5 5 3 5 6 3 5
2 5 3 2 2 5 4 5 5

1201
Q6. 1 4 2 2 2 4 2
Q7. 1 1 2 2 1 5 4 1 2 4 5 1 1 1 4 2 1
Q8OT. 2 2 1 2 1 2 4 2 4 2 2 2 4 4 4 4 2
Q8TT. 2 2 2 4 2 4 2 2 2 2 2 4 4 2 4 4 2
Q9. 5 2 2 5 5 2 2 2
Q10. 4 2 2 2 4 2 2 5 1 1 2 2 2 2 2 2 1 1 1 2 1 2 2 4 2 4 4 1 2 2 4 4
Q11. 2 5 5 2 2 2 2 1 4 1 4 4 5 1
Q12. 3 1 1 2 1 6 2 1 1 1 1 1 5 1 1 2 2 5 1 2 5 1 2 1 2 3 6 2 6 2 1
2 1 5 2 6 3 2 2 1

1211
Q6. 1 4 2 1 2 4 2
Q7. 2 2 2 2 3 3 2 3 3 4 3 2 5 2 3 3 2
Q8OT. 3 3 2 3 3 3 2 3 3 3 3 3 3 3 3 3 3
Q8TT. 2 2 2 2 4 2 3 2 2 2 2 4 3 3 4 2 4
Q9. 3 3 3 2 2 2 2 2
Q10. 4 4 3 4 2 3 3 4 3 3 3 3 2 2 2 3 3 2 3 3 4 3 2 2 3 3 3 2 3 2 4 2
Q11. 3 3 4 4 3 2 3 4 3 2 3 3 3 4
Q12. 3 2 2 3 3 5 3 1 2 2 2 2 4 3 4 3 3 3 4 3 2 3 3 3 3 3 3 3 3 3 3
3 3 3 3 3 3 3 5 3

1221
Q6. 1 4 2 2 2 4 1
Q7. 2 2 4 2 2 4 2 4 4 1 2 1 1 1 1 5 4
Q8OT. 4 3 4 4 4 2 4 2 4 3 2 4 2 4 2 4 3
Q8TT. 1 2 2 1 2 1 4 1 1 1 1 4 4 4 2 4 4
Q9. 1 1 1 1 1 1 1 2
Q10. 2 4 2 4 4 2 4 4 2 4 4 5 2 2 2 4 2 2 1 5 5 4 2 1 2 2 1 1 5 2 4 3
Q11. 2 4 4 4 4 2 2 5 3 2 2 4 2 4
Q12. 6 4 5 2 6 5 5 6 2 5 5 6 5 2 2 3 4 4 5 3 3 4 4 5 4 5 3 4 2 6 6
3 4 5 2 2 5 5 6 6

1231
Q6. 1 4 2 2 2 3 2
Q7. 1 1 5 1 4 3 4 2 2 4 4 2 5 1 2 5 3
Q8OT. 2 4 4 5 4 4 4 4 4 2 4 2 4 4 2 4 2
Q8TT. 4 1 1 1 4 2 4 2 2 2 2 2 4 4 4 4 4
Q9. 4 1 1 2 2 5 1 3
Q10. 4 4 2 4 2 1 5 5 2 1 4 3 2 1 4 2 1 1 4 4 5 4 1 1 1 1 4 2 2 4 4 4
Q11. 2 3 4 4 2 2 2 4 5 4 2 4 4 4
Q12. 1 1 1 1 1 6 1 3 2 3 1 2 6 1 6 3 1 1 4 1 1 1 1 3 6 6 4 4 2 3 3
3 2 3 3 3. 4 3 3 3

1241
Q6. 2 4 3 3 2 4 1
Q7. 1 2 2 2 4 2 4 2 4 2 3 2 4 2 4 5 1
Q8CT. 2 2 3 4 4 2 3 3 4 4 2 2 4 2 4 4 2
Q8TT. 2 1 1 3 2 4 4 1 1 4 1 2 4 4 4 5 4
Q9. 1 1 1 1 1 1 1 2
Q10. 4 2 1 4 2 1 1 2 4 2 4 4 2 2 2 4 1 4 1 4 4 4 2 2 2 2 2 3 4 2 4 2
Q11. 2 2 2 2 2 2 2 4 4 2 4 4 3 3
Q12. 5 3 3 1 6 3 4 2 5 5 2 3 4 1 1 2 2 1 3 2 1 2 3 3 3 5 2 3 2 3 2
2 3 3 2 4 5 3 2 2

1271
Q6. 2 3 5 3 2 4 1
Q7. 1 1 4 3 5 3 2 1 4 1 3 1 5 2 5 4 1
Q8CT. 4 2 2 1 4 2 4 2 2 2 1 2 2 1 5 4 4
Q8TT. 2 2 1 1 2 4 2 2 2 1 1 4 4 4 5 2 4
Q9. 2 1 1 1 2 1 1 1
Q10. 2 4 2 4 3 1 1 4 4 2 4 4 2 1 2 2 1 1 1 2 1 4 2 2 2 4 2 1 4 2 4 2
Q11. 4 4 4 4 4 2 2 2 1 2 2 2 4 4
Q12. 6 1 1 4 6 6 3 3 3 1 3 6 3 1 3 1 1 4 3 1 1 6 2 6 6 6 6 3 2 1 1
1 1 1 1 1 1 3 4 3

1281
Q6. 2 4 3 3 2 4 1
Q7. 1 1 2 2 3 1 3 1 1 2 3 1 3 2 2 2 2
Q8CT. 3 2 3 3 3 3 3 2 3 2 3 3 3 3 4 3 3
Q8TT. 2 1 1 2 1 2 2 2 2 1 3 2 3 5 4 3 3
Q9. 2 2 2 3 2 1 1 1
Q10. 3 3 2 3 2 2 1 3 1 2 4 4 2 2 2 2 1 2 2 3 1 4 2 2 2 4 2 1 5 2 2 2
Q11. 4 2 1 4 2 2 2 4 4 2 4 2 2 2
Q12. 2 2 2 5 6 5 2 2 2 2 5 4 4 2 4 2 2 1 2 4 1 4 4 1 4 4 2 4 2 2 4
4 4 2 2 2 4 2 2 4

1291
Q6. 2 4 3 3 1 3 2
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3100422 1 3 8 3 2 3 1
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3 2 1 3 3 1

3100432 1 3 6 2 2 2 2
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2 4 4 5 2 2 2 4 4 4 4 4 2 2
2 1 6 2 1 6 3 4 5 2 6 5 5 1 5 1 1 5 5 2 1 5 2 4 6 6 2 4 1 1 3 1 6 6
2 2 4 6 5 2

3100442 1 3 6 3 1 3 2
1 1 3 2 2 2 4 1 4 4 4 2 2 2 2 5 1
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2 3 4 3 3 3

3100462 1 4 8 3 1 3 2
2 2 4 4 2 2 3 2 3 3 4 2 2 2 2 4 2
4 4 4 4 4 2 2 2 4 3 4 4 4 4
2 2 2 2 2 5 3 2 2 3 3 4 3 2 4 2 3 2 4 3 2 4 2 3 4 2 2 3 2 2 3 3 3 3
2 2 5 2 3 2

KERALA

4100012 2 4 8 2 2 1 2
1 1 4 3 4 2 4 1 4 4 2 1 2 2 2 4 2
1 3 1 1 1 4 4 4 4 4 4 4 4 4
3 2 2 2 1 3 3 5 3 3 5 3 4 2 5 2 2 1 4 3 2 2 1 2 3 4 3 2 3 6 2 3 3
2 2 2 3 3 3 6

4100022 2 3 5 1 2 1 2
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3 4 2 1 3 4 2 5 5 2 6 5 5 2 4 2 2 1 2 1 1 2 1 6 4 3 2 2 1 3 1 3 4
3 5 1 5 3 3 5

4100032 2 3 6 2 2 1 2
1 1 3 3 4 2 2 1 5 2 3 1 2 1 5 3 1
5 5 5 5 5 2 2 2 4 5 5 4 4 4
4 1 1 1 6 6 4 2 1 4 4 1 5 2 4 1 4 2 6 1 1 4 1 4 4 1 2 4 4 2 4 1 4 4
2 2 6 5 4 4

4100042 2 4 5 3 2 1 2
1 1 1 5 5 4 5 2 4 4 2 1 5 1 1 4 4
4 2 4 4 4 2 2 2 2 2 2 2 4 4
6 4 2 1 5 5 3 2 5 5 5 5 5 2 6 2 2 2 5 1 2 3 2 5 1 2 2 4 5 4 5 3 2
1 1 1 5 5 6 5

4100052 2 4 8 3 2 1 2
2 2 4 2 4 2 2 2 2 4 2 2 2 1 2 4 4
2 4 2 2 2 2 2 4 2 2 2 2 2 2
2 3 2 2 5 6 2 1 2 4 2 2 3 2 4 2 3 2 3 4 3 2 3 4 3 1 2 3 2 3 3 2 3
2 2 3 2 3 2 3

4100062 2 4 8 3 2 2 2
1 1 2 2 4 4 4 2 4 4 2 2 4 3 4 2 3
2 2 2 2 2 3 3 4 4 2 4 2 3 4
2 1 2 2 3 5 5 5 2 2 5 3 5 1 3 1 1 5 2 1 1 6 4 4 3 3 4 4 3 4 2 2 3
5 2 1 5 5 3 5

4100072 2 4 8 3 2 1 2
1 1 2 4 4 4 4 2 4 4 2 2 3 4 2 2 2
4 3 2 2 2 4 4 2 2 2 4 2 4 5
3 4 2 2 5 6 3 5 2 5 4 5 5 3 6 2 4 4 2 5 4 5 2 2 4 4 6 3 2 5 4 2 4
2 2 3 5 2 4 3

4100082 2 4 1 1 2 1 2
1 1 1 1 1 1 4 1 1 4 4 1 1 1 1 1 1
4 4 4 4 1 1 2 1 4 2 4 4 4 4
1 1 1 1 1 1 1 1 1 1 1 4 1 1 4 1 3 3 1 1 1 1 3 1 1 1 1 3 1 1 1 1 1
1 2 4 4 2 2 4

4100102 2 3 5 1 2 1 2
1 1 2 2 4 3 4 3 3 1 4 1 2 1 2 1 2
4 4 4 4 3 4 4 3 4 2 4 2 4 4
2 1 2 2 5 5 3 6 4 3 6 4 5 2 3 2 3 2 5 2 1 5 2 5 6 5 3 5 5 5 5 5 5
5 5 5 6 6 5 2

4100112 2 5 8 2 2 1 2
1 1 4 3 4 2 2 1 4 4 2 2 4 4 1 1 1
1 2 1 1 1 4 4 4 4 2 4 4 4 4
2 1 5 1 5 5 5 6 3 1 5 6 6 1 5 6 6 5 5 6 1 1 2 1 1 5 1 2 5 4 5 2 1 1
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4100122 2 4 6 3 2 3 2
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3 3 5 6 1 4

4100132 2 4 6 3 2 1 2
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1 2 2 2 2 1 2 4 4 4 4 4 4 4
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4100142 2 4 5 2 2 1 2
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4 4 1 2 4 2 4

4100152 1 3 8 3 1 1 2
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4 3 2 2 2 6 2 4 3 3 2 5 5 2 5 2 5 2 5 2 2 5 2 5 5 3 2 3 2 3 3 2 4
3 2 2 4 4 3 5

4100172 1 4 8 3 1 2 2
1 1 2 3 4 4 3 2 5 4 3 1 5 2 2 4 1
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5 3 2 2 5 5 5 5

4100182 1 4 6 2 2 3 2
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1 2 5 6 5 5

4100192 1 4 8 3 1 3 2
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3 4 5 5 3 3

4100202 1 3 8 3 1 1 2
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1 3 3 3 2

4100212 1 3 3 3 1 2 2
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2 6 5 3 5 3 1 2 2 4 2 2 3 2 6 2 4 3 2 2 2 3 3 5 4 5 4 3 1 1 2 2 4 5
3 2 1 2 3 4

4100222 1 4 1 2 2 2 2
2 2 4 4 2 3 2 1 2 4 4 1 2 2 2 4 2
2 2 2 2 4 4 4 4 4 4 4 4 2 2
2 6 1 1 3 3 1 6 6 6 6 6 6 2 2 2 6 2 5 2 2 6 2 4 6 6 1 2 1 6 1 1 1 3 6
1 6 1 2 3

4100232 1 4 3 3 1 3 2
1 2 4 2 2 1 2 2 2 4 2 1 2 2 1 1 1
2 2 4 4 2 2 2 4 4 4 4 4 2 2
1 5 1 1 5 3 1 1 1 6 1 1 6 1 1 2 1 2 1 1 1 6 1 1 1 3 1 1 2 5 2 1 1 1
1 2 1 1 2 3

4100242 1 4 6 3 1 2 2
1 2 4 4 1 2 1 1 2 1 3 1 2 2 4 4 1
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5 1 2 1 3 2 3 3 3 2 5 4 2 1 2 1 4 1 4 2 1 6 6 5 4 2 2 1 2 6 3 1 2
1 1 2 6 6 4 5

APPENDIX H RESULTS OF THE ITEM ANALYSES FOR Q7, Q8, Q10

A.1 MATRIX OF THE PRODUCT-MOMENT INTER-CORRELATIONS OF THE ITEMS IN SECTION Q7 OF THE QUESTIONNAIRE ABOUT CURRICULUM INNOVATION FOR THE MAIN FAMILIAR SAMPLE (n = 80)

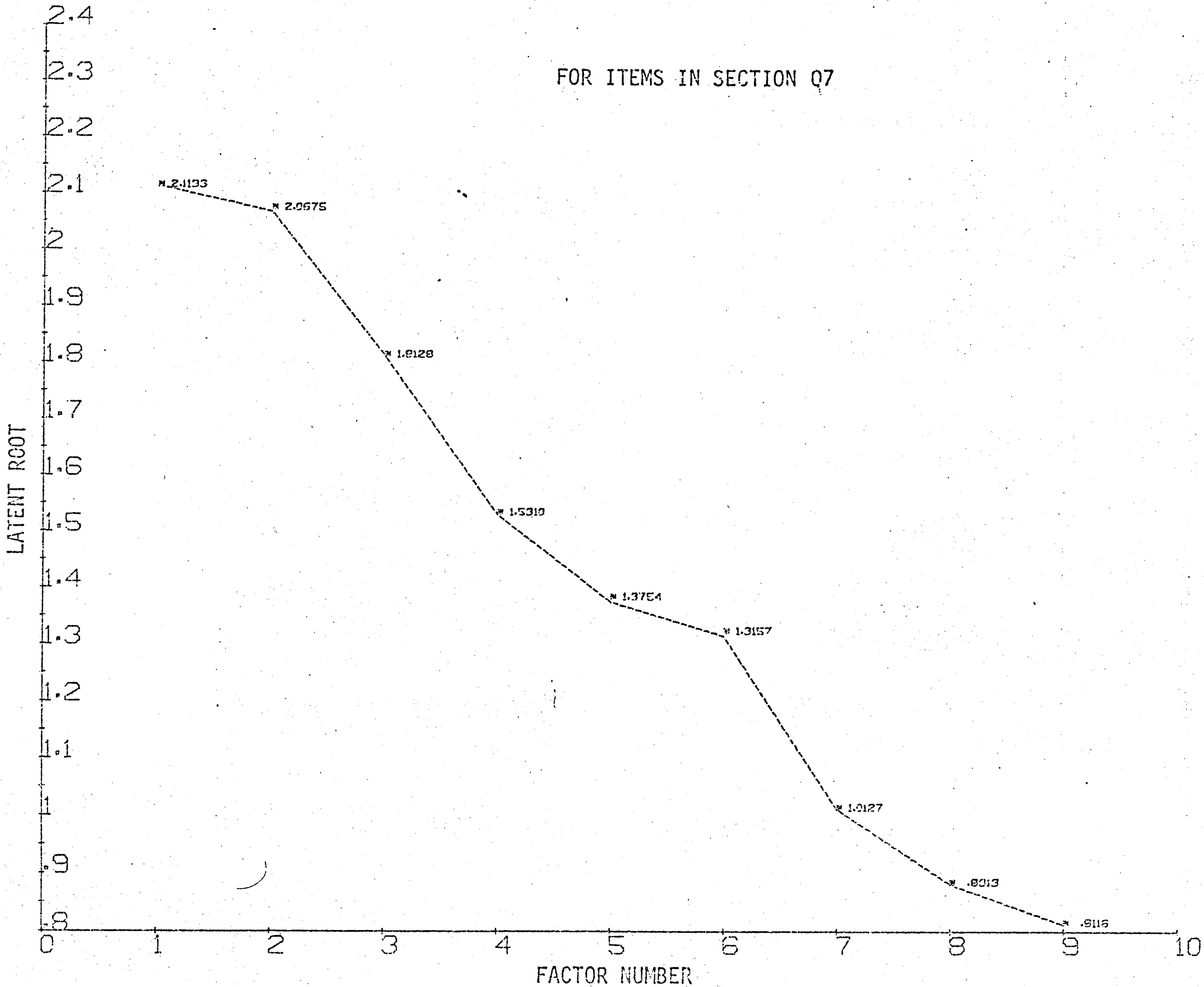
	Item Numbers in Section Q7																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	-																
2	.376	-															
3	.030	-.372	-														
4	.144	-.019	.147	-													
5	-.068	-.181	.337	.216	-												
6	.030	-.109	.184	.196	.119	-											
7	.056	-.098	.114	-.036	-.017	.156	-										
8	.138	.110	.107	-.155	-.079	.223	.094	-									
9	.272	.213	-.009	-.070	-.089	.016	.066	.059	-								
10	-.068	-.042	-.041	.146	-.136	.149	.094	-.062	-.120	-							
11	-.071	-.018	.026	-.037	.110	.032	.300	-.064	.159	-.153	-						
12	.070	.077	.044	-.039	.142	.238	-.025	.118	-.193	.062	-.178	-					
13	-.053	-.031	.012	.200	.028	.123	.204	-.026	.040	.059	.123	-.005	-				
14	.171	.095	.042	.243	.159	.028	.081	.025	-.177	.088	.046	.442	.267	-			
15	.298	.094	.029	-.009	.073	.152	.037	-.107	.197	-.011	.103	-.086	.064	-.013	-		
16	.030	-.020	.275	-.090	.237	.087	.049	.218	.243	-.316	.157	-.078	-.033	-.012	-.062	-	
17	-.020	.037	.011	-.115	-.014	-.038	.034	.125	.208	-.267	.136	-.048	.150	.112	-.057	.307	-

A.2 MATRIX FOR THE FIRST-LEVEL FACTORS OF ATTITUDE TO CURRICULUM INNOVATION FROM THE PRINCIPAL COMPONENTS ANALYSIS OF THE INTER-ITEM CORRELATIONS FOR SECTION Q7 IN THE MAIN FAMILIAR SAMPLE (n = 80)

Q7 Item Number	Common Factor Loadings (unrotated)									h^2 %
	I	II	III	IV	V	VI	VII	VIII	IX	
1	0.186	-0.156	-0.710	-0.002	-0.354	0.056	0.004	-0.291	0.218	.83
2	-0.101	-0.388	-0.677	0.135	0.049	0.147	-0.007	-0.096	-0.321	.77
3	0.504	0.375	0.286	0.045	-0.374	-0.086	0.078	-0.195	0.352	.79
4	0.067	0.497	-0.206	-0.278	-0.177	0.319	0.508	-0.191	-0.252	.87
5	0.423	0.419	0.209	0.056	-0.278	0.396	-0.200	0.020	-0.201	.72
6	0.324	0.412	-0.170	-0.042	-0.187	-0.489	0.066	0.399	-0.360	.87
7	0.350	0.117	-0.059	-0.365	0.335	-0.440	0.245	-0.382	0.115	.80
8	0.302	-0.085	-0.178	0.479	0.023	-0.551	0.147	-0.092	-0.062	.81
9	0.380	-0.525	-0.251	-0.227	-0.153	-0.066	0.192	0.075	-0.001	.79
10	-0.396	0.398	-0.167	-0.262	0.032	-0.381	0.163	-0.069	0.013	.81
11	0.442	-0.137	0.110	-0.428	0.308	0.061	-0.379	-0.155	-0.361	.80
12	0.001	0.475	-0.341	0.536	0.103	-0.032	-0.352	0.169	0.001	.84
13	0.252	0.269	-0.187	-0.351	0.497	0.073	0.305	0.273	0.151	.78
14	0.180	0.499	-0.450	0.192	0.369	0.318	-0.108	-0.122	0.144	.81
15	0.170	-0.086	-0.351	-0.446	-0.393	0.037	-0.346	0.411	0.237	.89
16	0.685	-0.213	0.194	0.277	-0.092	0.041	0.118	-0.075	-0.127	.70
17	0.472	-0.294	0.023	0.199	0.419	0.159	0.232	0.268	0.199	.73
Latent Root	2.113	2.067	1.813	1.531	1.375	1.316	1.013	0.881	0.810	
% Common Variance	12.4	12.16	10.66	9.01	8.09	7.74	5.96	5.18	4.77	

A.3 GRAPH OF LATENT ROOTS AGAINST FACTOR NUMBERS

FOR ITEMS IN SECTION Q7



B.1 MATRIX OF THE PRODUCT-MOMENT INTER-CORRELATIONS OF THE ITEMS IN SECTION Q8 OF THE QUESTIONNAIRE ABOUT CURRICULUM INNOVATION FOR THE MAIN FAMILIAR SAMPLE (n = 80)

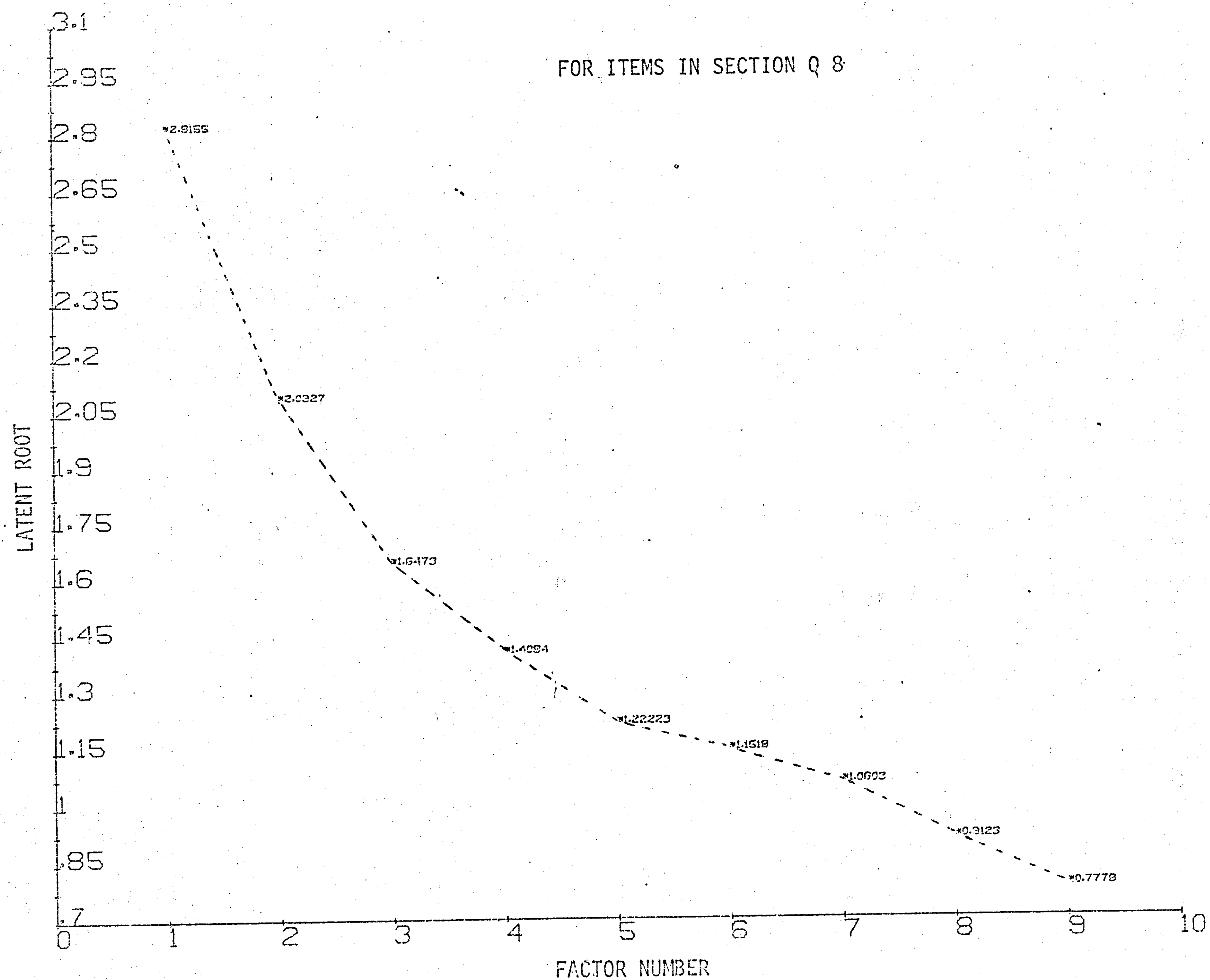
	Item Numbers in Section Q8																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	-																
2	.140	-															
3	.241	.240	-														
4	.254	.103	.311	-													
5	.240	-.075	.218	.391	-												
6	.007	.063	.024	.239	.128	-											
7	-.073	.003	-.118	.016	-.173	.080	-										
8	.354	.175	.169	.142	.055	-.069	-.147	-									
9	.355	.150	.514	.329	.325	.175	-.149	.128	-								
10	.173	.040	.080	.359	.193	.067	.069	-.018	.097	-							
11	-.042	-.016	.197	-.044	.060	-.020	-.013	-.033	-.176	.023	-						
12	-.216	-.043	.091	.207	.026	-.070	.080	-.128	-.147	.043	-.147	-					
13	-.186	-.225	-.059	.066	.106	.003	.164	-.203	.043	.066	-.045	.311	-				
14	-.143	-.198	-.373	-.092	-.139	-.027	-.037	.062	-.192	-.195	-.137	.079	.261	-			
15	.079	-.203	-.107	.137	.186	.298	.004	-.043	.083	-.047	.015	.146	.332	.096	-		
16	.091	-.029	-.159	-.111	-.001	-.014	.376	.106	-.154	-.045	.075	.118	.137	.223	.122	-	
17	-.034	.000	.001	-.025	.011	-.067	.374	.038	-.096	-.026	.046	.085	.026	.119	.076	.329	-

B.2 MATRIX FOR THE FIRST-LEVEL FACTORS OF ATTITUDE TO CURRICULUM INNOVATION FROM THE PRINCIPAL COMPONENTS ANALYSIS OF THE INTER-ITEM CORRELATIONS FOR SECTION Q8 IN THE MAIN FAMILIAR SAMPLE (n = 80)

Q8 Item No	Common Factor Loadings (unrotated)									h^2
	I	II	III	IV	V	VI	VII	VIII	IX	%
1	-0.582	-0.025	0.328	0.403	-0.060	-0.026	-0.189	0.158	-0.153	77.1
2	-0.343	0.269	0.339	-0.169	0.237	0.332	0.246	-0.331	-0.226	72.2
3	-0.680	0.003	0.097	-0.291	0.134	-0.273	0.407	0.050	-0.090	83.2
4	-0.588	-0.463	-0.023	-0.090	0.168	0.080	-0.173	-0.266	0.193	76.2
5	-0.505	-0.407	-0.122	0.087	-0.162	-0.296	-0.129	0.082	0.315	68.4
6	-0.211	-0.321	-0.143	0.035	-0.436	0.602	0.185	-0.302	0.061	86.7
7	0.296	-0.338	0.542	-0.335	-0.071	0.323	0.017	0.235	-0.064	77.7
8	-0.332	0.146	0.393	0.540	0.202	-0.153	0.002	-0.299	-0.011	73.3
9	-0.709	-0.149	-0.092	0.140	0.082	0.108	0.266	0.409	-0.136	86.1
10	-0.330	-0.275	0.109	-0.309	0.008	0.064	-0.712	-0.054	-0.142	83.6
11	-0.026	0.089	0.157	-0.300	-0.592	-0.545	0.098	-0.331	-0.176	94.6
12	0.157	-0.473	-0.113	-0.305	0.566	-0.155	0.121	-0.296	0.088	90.3
13	0.233	-0.650	-0.255	-0.042	0.148	-0.165	0.091	0.158	-0.438	84.8
14	0.480	-0.216	-0.047	0.545	0.207	-0.038	-0.005	-0.179	-0.038	88.5
15	0.016	-0.614	-0.200	0.289	-0.328	0.020	0.233	-0.106	-0.047	83.3
16	0.293	-0.377	0.624	0.165	-0.071	-0.083	-0.052	-0.030	-0.234	72.2
17	0.215	-0.291	0.613	-0.057	-0.003	-0.094	0.226	0.160	0.473	84.1
Latent Roof	2.815	2.093	1.647	1.408	1.222	1.152	1.060	0.912	0.778	
% Common Variance	16.5	12.3	9.7	8.3	7.19	6.77	6.24	5.37	4.57	

B.3 GRAPH OF LATENT ROOTS AGAINST FACTOR NUMBERS

FOR ITEMS IN SECTION Q 8



C.7 MATRIX FOR THE PRODUCT-MOMENT INTER-CORRELATIONS OF THE ITEMS IN SECTION Q10 OF THE QUESTIONNAIRE ABOUT CURRICULUM INNOVATION FOR THE MAIN FAMILIAR SAMPLE (n = 80)

Item Numbers in Section Q10

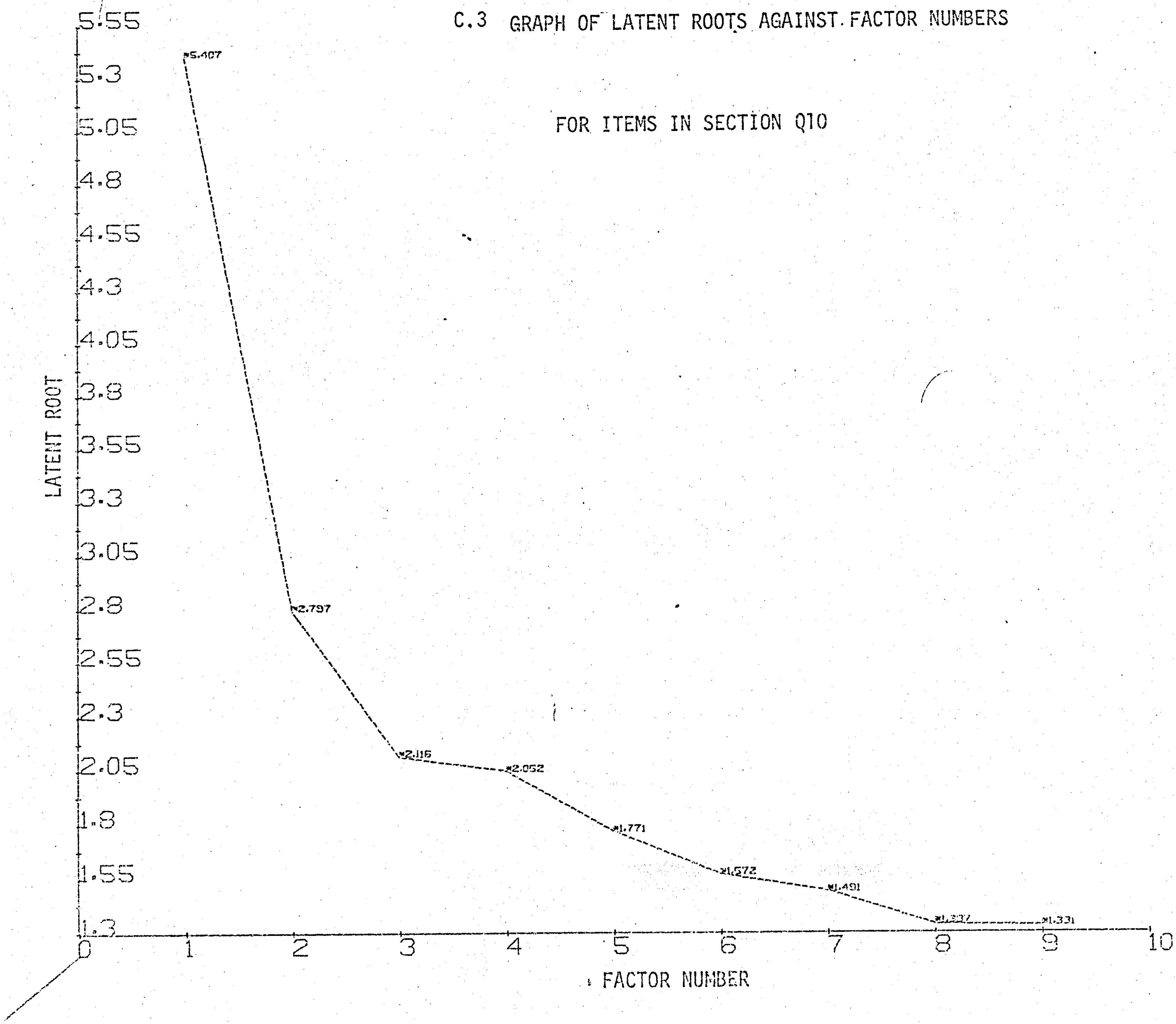
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1	-																															
2	[illegible]	-																														
3	[illegible]	.164	-																													
4	[illegible]	.303	.131	-																												
5	[illegible]	-.015	.352	-.212	-																											
6	.117	.032	.452	-.152	.158	-																										
7	[illegible]	.065	.077	-.012	.038	.004	-																									
8	[illegible]	.157	-.309	.068	-.093	-.305	.119	-																								
9	-.240	.092	-.064	.094	.072	-.105	.515	.144	-																							
10	[illegible]	.253	.398	.097	.122	.158	.256	-.164	.264	-																						
11	-.015	.228	-.318	-.023	-.254	-.335	.040	.250	-.016	-.030	-																					
12	[illegible]	.239	-.207	.220	-.120	-.249	.295	.242	.227	.073	.189	-																				
13	[illegible]	.160	.426	.120	.131	.304	-.011	-.252	-.124	.026	-.081	-.324	-																			
14	.271	.101	.243	.043	.190	.265	-.034	-.212	-.194	.115	-.220	-.252	.534	-																		
15	.243	.023	.217	-.050	-.049	.038	.175	-.127	.053	.138	-.018	-.003	.409	.363	-																	
16	[illegible]	.117	-.120	.126	-.082	-.132	.027	.175	.066	.071	.138	.254	.037	-.112	-.045	-																
17	[illegible]	.079	.300	-.052	.135	.506	.104	-.286	.002	-.033	-.188	-.218	.570	.216	.140	-.101	-															
18	[illegible]	-.047	-.081	.015	-.119	.079	.280	.073	.208	.084	.011	.206	-.136	-.196	-.110	.101	.153	-														
19	[illegible]	.200	-.129	.203	-.210	-.076	.213	.437	.194	.002	-.008	.122	-.155	.036	-.000	.140	.034	.118	-													
20	[illegible]	.194	-.169	.155	.037	-.284	.103	.064	.088	.066	.089	.273	-.103	-.019	-.037	.141	-.241	.046	.194	-												
21	[illegible]	-.068	-.207	.014	-.005	-.271	.449	.103	.403	.059	.094	.161	-.153	-.165	.015	.171	-.014	.095	.287	.296	-											
22	[illegible]	.274	-.203	.075	-.185	-.213	.120	.291	.044	.030	.289	.329	-.058	-.039	-.022	.363	-.132	-.055	.119	.267	.253	-										
23	[illegible]	.065	.093	-.005	-.023	.229	.110	-.211	.045	.097	-.069	.203	.165	.124	.111	.109	.003	.153	-.087	-.086	.021	.146	-									
24	[illegible]	-.037	.267	-.028	.156	.053	-.090	-.204	-.129	.100	.054	-.014	.308	.201	.183	.014	-.066	.030	-.355	-.046	-.248	-.201	.273	-								
25	.157	.231	.341	-.063	.131	.322	-.121	-.245	-.065	.127	-.194	-.134	.290	.236	.111	-.086	.153	-.053	-.103	-.070	-.270	-.200	.200	.308	-							
26	[illegible]	.032	.353	-.264	.245	.249	-.144	-.203	-.153	.039	-.067	-.216	.384	.376	.104	-.284	.127	-.268	-.291	-.218	-.454	-.258	.045	.306	.355	-						
27	.041	.149	.228	-.007	.113	.190	-.184	-.090	-.336	-.139	-.158	-.203	.218	.279	.116	-.043	.035	-.171	.109	-.225	-.226	-.197	-.091	.144	.111	.060	-					
28	-.117	.165	.026	.052	-.090	-.031	.175	.014	.233	.035	.068	.206	-.018	-.290	-.017	.222	-.027	.377	.057	.203	.159	.069	.119	.102	.051	-.242	-.085	-				
29	-.103	.060	-.031	-.110	.064	-.103	-.203	-.208	-.017	-.002	.271	.111	-.116	-.169	-.166	.335	-.137	.225	.021	.089	-.107	.128	.117	.055	-.055	.030	-.258	.135	-			
30	[illegible]	-.038	.079	-.039	-.226	.118	.172	-.099	.035	.002	-.004	.035	.077	.005	.259	.152	-.039	-.192	.063	-.256	.045	.109	.173	.062	.021	-.065	.025	.126	-.035	-		
31	[illegible]	.224	-.262	-.030	-.115	-.234	.195	.465	.263	.100	.174	.237	-.328	-.156	-.209	.100	-.148	.043	.254	.112	.144	.333	-.179	-.305	-.322	-.035	-.185	-.060	.035	-.093	-	
32	[illegible]	.125	.357	.006	.456	.271	-.054	-.163	-.163	.052	-.085	-.180	.363	.260	.056	-.035	.123	-.163	-.280	-.013	-.102	-.001	.146	.265	.121	.107	.356	-.076	-.130	.024	-.224	-

C.2 MATRIX FOR THE FIRST-LEVEL FACTORS OF ATTITUDE TO CURRICULUM INNOVATION FROM THE PRINCIPAL COMPONENTS ANALYSIS OF THE INTER-ITEM CORRELATIONS FOR SECTION Q10 IN THE MAIN FAMILIAR SAMPLE (n = 80)

Variables (Q10 Item Numbers)	Common Factor Loadings (unrotated)									h^2 %
	I	II	III	IV	V	VI	VII	VIII	IX	
1	.364	-.004	.136	-.248	.136	-.056	.244	-.404	-.365	.590
2	-.063	.472	.493	-.167	-.332	.306	-.093	-.031	.101	.815
3	.626	.410	-.040	-.013	-.215	.076	.030	.068	.123	.634
4	-.144	.278	.250	-.194	.039	.305	.235	.000	.550	.650
5	.358	.090	-.122	.067	-.548	-.309	.312	.265	-.209	.763
6	-.583	.236	-.264	.025	-.050	.363	-.184	.229	-.148	.708
7	-.262	.602	-.389	-.177	.009	-.263	-.127	-.063	-.090	.711
8	-.555	-.077	.252	-.211	-.208	.119	-.133	-.025	-.246	.558
9	-.379	.464	-.418	-.010	-.203	-.155	-.103	-.042	.094	.620
10	.059	.532	-.055	.052	-.322	-.150	-.137	-.041	.263	.508
11	.376	-.047	.428	.162	.059	-.162	-.186	-.164	-.212	.489
12	-.517	.338	.168	.189	.004	-.046	-.010	-.065	.167	.480
13	.620	.339	.247	-.108	.104	-.030	-.044	-.039	-.157	.612
14	.558	.191	.245	-.344	-.043	-.123	-.086	-.140	-.112	.583
15	.300	.331	.125	-.219	.383	-.287	-.162	-.315	-.085	.625
16	-.329	.287	.339	.208	.156	.120	.060	.342	-.193	.545
17	.393	.237	-.349	-.145	-.041	.298	-.149	.119	-.297	.568
18	-.252	.278	-.346	.343	-.000	.378	.149	-.260	-.301	.701
19	-.391	.227	.050	-.520	-.006	.394	-.009	-.169	-.136	.680
20	-.363	.213	.218	-.010	-.217	-.192	.475	-.188	.080	.576
21	-.463	.325	-.271	-.267	.165	-.338	.289	.003	-.238	.746
22	-.452	.265	.426	-.068	.041	-.156	-.156	.309	-.141	.626
23	.147	.417	.070	.388	.263	-.040	-.107	.052	-.080	.442
24	.425	.153	.261	.467	.096	-.214	.127	-.228	.046	.615
25	.505	.223	.091	.204	-.108	.192	-.071	-.240	.139	.485
26	.587	-.111	.118	.139	-.342	-.167	-.414	-.219	-.001	.754
27	.434	-.090	.263	-.367	.118	.249	.284	.091	-.102	.576
28	-.235	.409	-.076	.377	.181	.252	.267	-.078	-.034	.545
29	-.236	-.045	.270	.546	-.211	.156	-.104	.009	-.377	.651
30	.047	.235	.028	-.033	.606	-.079	-.349	.330	.129	.680
31	-.547	-.006	.073	-.246	-.394	-.057	-.342	.050	-.089	.651
32	.480	.186	.217	-.024	-.110	-.196	.330	.488	-.109	.831
Latent Roots	5.407	2.797	2.116	2.052	1.771	1.572	1.491	1.337	1.331	
% Common Variance	16.90	8.74	6.61	6.41	5.53	4.91	4.66	4.18	4.16	

C.3 GRAPH OF LATENT ROOTS AGAINST FACTOR NUMBERS

FOR ITEMS IN SECTION Q10



APPENDIX H (continued)

D. <u>The Inter-Item Correlations for the Composite Variables f_1, f_2, f_3, f_4, f_7, f_8, f_9</u>

(NOTE: the inter-item correlations for f_5 and f_6 are given separately in Appendix O)

1. <u>The Inter-Item Correlations for the Composite Variable (f_1)</u>

	Item Numbers in Section Q7				
	16	9	17	10	11
16	-				
9	.243	-			
17	.307	.208	-		
10	.316	.120	.267	-	
11	.157	.159	.136	.153	-

NOTE: a. the direction of scoring was reversed for item 10

b. $\bar{r}$ = .207; alpha coefficient = .56

2. <u>The Inter-Item Correlations for the Composite Variable (f_2)</u>

	Item Numbers in Section Q7					
	3	5	14	6	4	-
3	-					
5	.337	-				
14	.042	.159	-			
6	.184	.119	.028	-		
4	.147	.216	.243	.196	-	
12	.044	.142	.442	.238	-.039	-

(NOTE: $\bar{r}$ = .166; alpha coefficient = .54)

3. The Inter-Item Correlations for the Composite Variable (f_3)

	Item Numbers in Section Q8					
	4	9	5	3	1	10
4	-					
9	.329	-				
5	.391	.325	-			
3	.311	.514	.024	-		
1	.254	.355	.240	.241	-	
10	.359	.097	.193	.080	.173	-

(NOTE: $\bar{r}$ = .259; alpha coefficient = .68)

4. The Inter-Item Correlations for the Composite Variable (f_4)

	Item Numbers in Section Q8		
	16	7	17
16	-		
7	.376	-	
17	.329	.374	-

(NOTE: $\bar{r}$ = .359; alpha coefficient = .63)

5. <u>The Inter-Item Correlations for the Composite Variable (f_7)</u>

	Item Numbers in Section Q10										
	9	21	7	13	26	14	27	18	32	24	25
9	-										
21	.403	-									
7	.515	.449	-								
13	.124	.153	.011	-							
26	.153	.454	.144	.384	-						
14	.194	.165	.034	.534	.376	-					
27	.336	.226	.184	.213	.060	.279	-				
18	.208	.095	.280	.136	.268	.196	.171	-			
32	.163	.102	.054	.363	.107	.260	.356	.163	-		
24	.129	.248	.090	.308	.306	.201	.144	.030	.265	-	
25	.065	.270	.121	.290	.365	.236	.111	.053	.121	.308	-

NOTE: a. the direction of scoring for items 13, 26, 14, 27, 32, 24 and 25 was reversed.

b. $\bar{r}$ = 0.218; alpha coefficient = 0.75.

6. The Inter-Item Correlations for the Composite Variable (f_8)

	Item Numbers in Section Q10								
	22	11	6	8	17	16	12	20	31
22	-								
11	.289	-							
6	.213	.335	-						
8	.291	.250	.305	-					
17	.132	.188	.506	.286	-				
16	.363	.138	.132	.175	.101	-			
12	.329	.189	.249	.242	.218	.254	-		
20	.267	.089	.284	.064	.241	.141	.237	-	
31	.333	.174	.284	.465	.148	.100	.237	.112	-

(NOTE: a. the direction of scoring for items 6 and 17 was reversed.

b. $\bar{r}$ = 0.233; alpha coefficient = 0.73)

7. The Inter-Item Correlations for the Composite Variable (f_9)

	Item Numbers in Section Q10		
	10	2	3
10	-		
2	.253	-	
3	.398	.164	-

(NOTE: $\bar{r}$ = .272; alpha coefficient = 0.53)

APPENDIX H (continued)

MEANS, STANDARD DEVIATIONS AND FREQUENCY DISTRIBUTIONS OF SCORES FOR THE ITEMS OF SECTIONS Q7, Q8, Q9 and Q10 RESPECTIVELY, FOR THE MAIN FAMILIAR SAMPLE (n = 80)

(NOTE: (a) About the direction of scoring, see Chapter 4.

(b) The Minimum possible score for all sections was 1. The Maximum possible score was 5 for Sections Q7, Q8 and Q10; and 7 for Section Q9)

A. For the Items of Section Q7

Item No	Frequency distributions of Item Scores					Mean	Standard Deviation	Direction of Scoring
	1	2	3	4	5			
1	0	0	0	33	47	4.588	0.495	reverse
2	0	0	0	31	49	4.612	0.490	reverse
3	9	24	5	31	11	3.137	1.300	reverse
4	3	15	23	28	11	3.363	1.058	reverse
5	14	31	14	15	6	2.600	1.197	reverse
6	7	18	20	25	10	3.162	1.174	reverse
7	5	25	10	25	15	3.250	1.258	normal
8	29	39	5	3	4	1.925	1.016	normal
9	11	24	6	33	6	2.988	1.258	normal
10	4	16	14	34	12	3.425	1.123	reverse
11	4	23	18	24	11	3.188	1.148	normal
12	1	2	4	30	43	4.400	0.805	reverse
13	13	20	13	26	8	2.950	1.282	reverse
14	1	3	4	41	31	4.225	0.811	reverse
15	10	14	5	32	19	3.450	1.359	reverse
16	12	19	7	28	14	3.162	1.373	normal
17	25	24	16	12	3	2.300	1.174	normal

B. For the Items of Section Q8

Item No	Frequency distributions of Item Scores					Mean	Standard Deviation	Direction of Scoring
	1	2	3	4	5			
1	1	5	0	50	24	4.137	.807	reverse
2	0	3	3	33	41	4.400	.739	reverse
3	2	7	4	38	29	4.062	.998	reverse
4	1	13	9	35	22	3.800	1.060	reverse
5	4	17	7	36	16	3.537	1.179	reverse
6	3	17	10	44	6	3.412	1.027	reverse
7	3	17	5	49	6	3.475	1.031	normal
8	1	8	10	41	20	3.887	.941	reverse
9	1	6	2	41	30	4.162	.892	reverse
10	1	5	0	36	38	4.312	.865	reverse
11	4	9	5	42	20	3.812	1.092	reverse
12	5	16	9	41	9	3.412	1.122	normal
13	3	15	10	46	6	3.462	1.006	normal
14	4	9	8	46	13	3.687	1.038	normal
15	2	9	4	44	21	3.912	.996	normal
16	6	12	4	42	16	3.625	1.184	normal
17	4	3	12	46	15	3.812	.956	normal

C. For the Items of Section Q9

Item No	Frequency distributions of Item Scores							Mean	Standard Deviation	Direction of Scoring
	1	2	3	4	5	6	7			
1	1	1	3	3	23	24	25	5.725	1.242	reverse
2	0	1	1	2	8	30	38	6.237	0.971	reverse
3	2	1	3	1	14	30	29	5.875	1.325	reverse
4	1	3	5	6	10	30	25	5.637	1.451	reverse
5	2	4	3	4	8	25	34	5.787	1.573	reverse
6	0	4	6	4	12	27	27	5.662	1.440	reverse
7	0	1	4	1	7	27	40	6.187	1.126	reverse
8	2	2	4	0	15	32	25	5.750	1.392	reverse

D. For the Items of Section Q10

Item No	Frequency distributions of Item Scores					Mean	Standard Deviation	Direction of Scoring
	1	2	3	4	5			
1	9	32	6	21	12	2.937	1.315	reverse
2	1	13	5	49	12	3.725	0.954	normal
3	13	53	7	3	4	2.150	0.915	normal
4	0	9	2	54	15	3.938	0.817	normal
5	9	44	12	12	3	2.450	1.005	normal
6	1	4	8	42	25	4.075	0.853	reverse
7	27	24	4	21	4	2.387	1.326	normal
8	7	11	4	32	26	3.738	1.290	normal
9	17	39	5	17	2	2.350	1.115	normal
10	9	44	9	16	2	2.475	1.018	normal
11	3	2	23	41	11	3.688	0.880	normal
12	2	16	17	38	7	3.400	0.988	normal
13	2	7	5	54	12	3.838	0.878	reverse
14	3	10	6	41	20	3.812	1.068	reverse
15	0	8	7	45	20	3.963	0.863	reverse
16	14	44	13	9	0	2.213	0.867	normal
17	2	1	4	32	41	4.362	0.846	reverse
18	23	25	8	22	2	2.438	1.241	normal
19	12	44	10	13	1	2.338	0.967	normal
20	1	15	18	41	5	3.425	0.911	normal
21	18	22	4	26	10	2.850	1.415	normal
22	1	27	14	35	3	3.150	0.982	normal
23	3	4	3	45	25	4.062	0.946	reverse
24	1	9	5	44	21	3.937	0.946	reverse
25	2	5	8	47	18	3.925	0.897	reverse
26	3	24	19	29	5	3.113	1.031	reverse
27	7	21	4	36	12	3.312	1.259	reverse
28	0	10	3	45	22	3.988	0.907	reverse
29	4	20	18	35	3	3.162	1.012	normal
30	0	8	14	53	5	3.687	0.739	reverse
31	7	21	20	30	2	2.988	1.049	normal
32	2	22	10	40	6	3.325	1.041	reverse

APPENDIX I

THE FIRST-LEVEL FACTOR SCORES AND THE SCORES FOR THE INDEPENDENT VARIABLES (BACKGROUND, KNOWLEDGE, ORGANISATION AND PERSONALITY) FOR THE MAIN FAMILIAR SAMPLE

(Note: for details of scoring procedures, see text)

	Q6							Q7		Q8		Q9		Q10			Q11	Q12
	A	B	1	2	3	4	5	f_1	f_2	f_3	f_4	f_5	f_6	f_7	f_8	f_9		
1011	2	1	1	1	2	1	2	14	19	27	10	25	19	43	30	10	49	216
1021	2	1	1	1	2	1	2	16	22	26	7	20	11	38	29	14	44	228
1031	2	1	2	2	1	2	1	11	21	25	14	27	20	36	32	10	47	200
1041	1	2	2	2	2	2	2	13	21	25	12	26	16	29	33	8	44	192
1051	2	1	1	1	2	2	2	23	21	29	12	28	21	42	33	10	45	228
1061	2	1	1	2	2	1	2	15	25	12	8	7	21	41	27	10	38	226
1081	2	1	2	2	1	2	2	10	23	28	9	24	17	28	29	11	49	202
1091	2	1	2	2	1	1	2	15	26	24	12	24	19	34	34	8	50	189
1101	1	1	2	2	2	2	1	10	24	27	12	25	18	31	25	8	42	212
1111	1	1	2	2	1	1	2	12	20	25	12	22	17	30	30	6	51	220
1121	1	2	2	1	2	2	1	19	17	28	14	26	20	53	40	11	31	138
1141	2	1	1	1	2	1	1	13	18	27	10	28	21	38	31	10	44	177
1151	2	1	2	1	2	2	1	17	20	26	13	26	14	34	35	10	35	157
1161	2	1	2	2	2	2	1	11	25	26	11	26	20	39	27	11	40	229
1171	2	1	1	1	2	1	2	12	21	28	10	24	18	37	35	10	44	199
1181	2	1	2	2	2	1	2	22	19	23	12	17	15	33	35	4	28	136
1201	1	2	1	1	2	2	2	12	24	22	8	21	12	25	28	13	38	217
1211	1	2	1	1	2	2	2	13	22	22	9	22	17	37	29	8	38	197
1221	1	2	1	1	2	2	1	20	22	28	12	28	20	42	38	8	38	123
1231	1	2	1	1	2	1	2	16	20	22	12	27	15	41	36	11	42	204
1241	2	2	2	2	2	2	1	17	22	23	13	28	20	41	36	13	48	198
1271	2	1	2	2	2	2	1	17	18	27	8	28	19	34	34	10	27	192
1281	2	2	2	2	2	2	1	12	25	27	8	24	19	31	31	11	45	184
1291	2	2	2	2	1	1	2	16	20	27	7	28	21	35	35	9	39	171
1301	2	2	1	2	1	1	2	15	23	29	9	24	17	42	32	12	50	186
1311	2	2	1	1	2	1	2	19	19	23	12	26	20	40	37	9	41	179
1321	1	1	2	1	2	1	2	21	26	22	3	14	3	15	10	7	67	260
1331	2	1	1	2	1	2	1	19	23	23	12	25	20	43	30	8	40	220
1351	1	2	1	1	2	1	2	13	23	26	13	27	20	40	35	11	44	220
1371	1	2	1	1	2	2	2	15	16	25	8	19	11	30	25	7	40	204
1381	1	2	2	1	2	2	2	11	18	24	10	27	19	32	33	11	51	190
1391	1	2	2	1	2	2	2	12	17	21	9	15	15	30	29	11	40	196
1411	1	2	1	1	2	2	2	17	19	15	7	22	14	22	20	5	44	194
1421	1	2	2	1	1	1	2	20	23	23	13	23	19	34	28	7	56	212
1431	1	2	2	1	2	1	2	18	21	27	13	22	16	24	31	11	30	153
1441	1	1	1	1	2	1	2	18	18	23	13	28	17	34	41	10	49	195
1451	1	1	2	1	2	2	1	19	21	28	14	28	21	35	32	10	58	172
1461	1	2	2	1	2	2	1	19	24	24	11	23	16	36	33	10	43	193
1471	2	2	2	1	2	1	2	18	24	28	13	26	18	32	32	10	39	166
1481	1	1	1	1	2	1	1	11	16	17	15	26	17	36	32	10	48	233
1491	2	2	1	1	2	2	1	9	27	28	12	26	21	33	36	9	42	180
1501	2	2	1	1	2	1	2	20	21	26	13	26	11	41	36	5	39	165
1521	1	1	2	1	2	1	2	16	22	22	10	14	11	42	25	11	40	219
1531	1	2	2	2	2	1	2	13	23	26	10	21	19	40	32	10	47	201
1541	2	1	2	1	2	1	1	13	24	29	9	26	19	42	33	10	53	225
1561	2	1	2	1	2	1	1	15	23	22	13	27	18	35	37	10	34	179
1571	2	2	1	1	2	1	2	22	14	24	12	25	18	43	37	8	38	132
1581	2	2	1	1	2	2	2	17	19	20	9	22	18	43	31	10	44	176
1591	2	2	1	1	2	2	1	16	24	23	13	25	19	48	33	11	40	202
1601	2	2	1	1	2	1	2	20	21	22	15	24	19	42	35	12	44	180
1611	2	1	1	2	2	2	2	17	23	21	11	21	15	36	31	11	39	200
1621	2	1	2	2	2	1	1	15	24	28	9	28	21	38	29	9	37	205
1631	2	1	2	2	2	1	2	10	21	21	10	20	9	35	24	14	46	213

1651	2	1	1	2	2	1	1	15	20	27	12	25	19	44	35	12	48	235
1661	2	2	2	1	2	2	2	19	26	18	5	21	19	41	28	10	43	199
1671	1	1	2	2	1	1	2	13	18	28	10	24	19	40	27	13	56	223
1681	1	2	2	2	1	1	2	11	20	24	12	24	18	37	29	10	45	189
1691	1	1	1	2	1	2	2	16	20	12	14	28	21	25	37	7	22	193
1701	2	2	2	1	2	1	2	10	15	23	12	28	8	25	23	12	28	214
1711	2	1	1	1	2	2	2	16	16	25	12	20	19	37	29	9	47	175
1721	1	1	2	2	2	1	2	16	26	24	13	26	20	31	28	10	34	185
1731	1	1	1	1	2	1	1	13	24	20	12	23	18	33	32	11	56	206
1741	2	1	1	2	2	2	2	17	21	28	4	25	17	27	37	11	35	173
1751	2	2	2	2	2	2	1	22	23	22	10	27	14	28	22	11	40	190
1761	2	1	2	1	2	2	2	5	28	20	10	25	21	34	37	9	57	217
1771	2	1	1	1	2	1	2	14	19	24	9	24	18	33	24	8	35	209
1781	1	2	1	1	2	1	2	9	19	23	12	19	15	25	30	10	54	210
1791	1	2	1	1	2	1	2	17	19	18	8	25	12	23	25	13	40	185
1801	1	2	2	1	2	1	1	16	18	26	12	20	18	30	35	10	55	206
1811	2	1	1	1	2	2	2	17	19	25	13	25	17	25	26	5	48	163
1821	2	2	2	1	2	1	2	12	30	22	8	22	16	32	26	4	37	150
1831	2	2	1	1	2	1	2	18	20	25	12	27	19	44	30	9	34	174
1841	1	2	1	1	2	2	2	11	21	24	12	23	16	39	31	10	37	186
1851	2	2	2	2	2	2	2	17	20	22	12	28	20	38	35	7	42	198
1871	2	2	2	2	2	2	1	13	21	19	10	26	16	43	27	8	42	221
1881	1	2	1	1	2	1	2	16	14	29	13	27	21	29	33	10	42	174
1891	2	1	1	1	2	1	2	14	18	23	12	20	15	38	32	10	36	195
1921	2	2	2	2	2	2	2	6	7	30	14	26	20	34	34	10	52	240
1931	2	2	2	2	1	2	2	13	17	20	12	26	19	35	34	10	48	184
1941	2	2	1	2	1	1	2	15	20	26	12	20	15	38	26	10	51	192

APPENDIX I (continued)

FREQUENCY DISTRIBUTIONS OF THE SCORES FOR THE COMPOSITE VARIABLES (REPRESENTING THE FIRST-LEVEL FACTORS OF ATTITUDE TO CURRICULUM INNOVATION) FOR THE MAIN FAMILIAR SAMPLE (n = 80)

NOTE: The frequency distributions for (f_5) and (f_6) are given in Appendix O

A.

(f_1) scores	Frequency distribution of scores
5 - 7	2
8 - 10	6
11 - 13	22
14 - 16	21
17 - 19	20
20 - 22	8
23 - 25	1

B.

(f_2) scores	Frequency distribution of scores
7 - 10	1
11 - 14	2
15 - 18	14
19 - 22	36
23 - 26	24
27 - 30	3

C.

(f_3) scores	Frequency distribution of scores
12 - 14	2
15 - 17	2
18 - 20	7
21 - 24	31
25 - 27	23
28 - 30	15

D.

(f_4) scores	Frequency distribution of scores
3 - 4	2
5 - 6	1
7 - 8	10
9 - 10	19
11 - 12	28
13 - 14	18
15 - 16	2

E.

(f_7) scores	Frequency distribution of scores
15 - 21	1
22 - 28	11
29 - 35	28
36 - 42	31
43 - 49	8
50 - 56	1

F.

(f_8) scores	Frequency distribution of scores
10 - 15	1
16 - 21	1
22 - 27	15
28 - 33	38
34 - 39	23
40 - 45	2

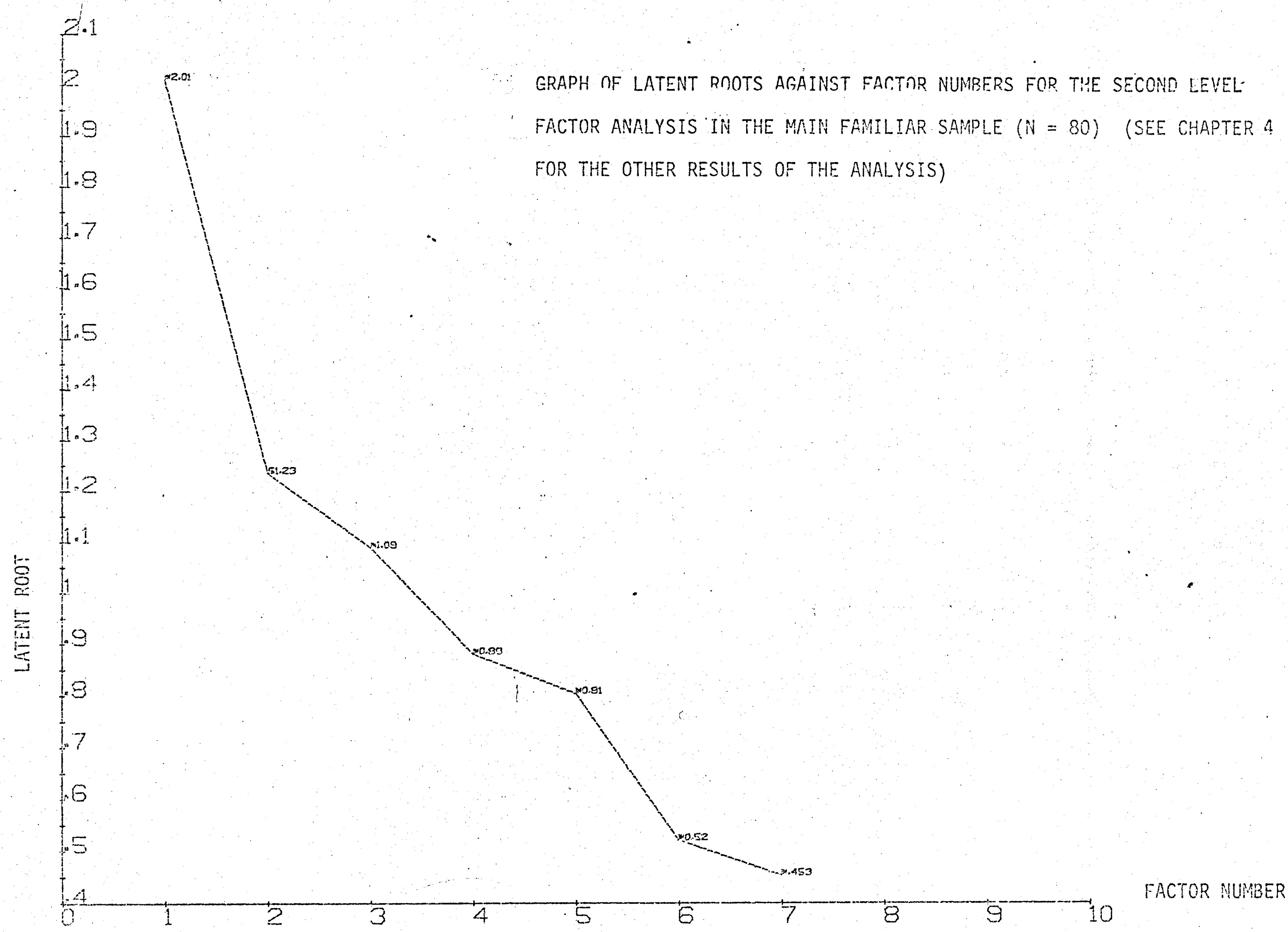
G.

(f_9) scores	Frequency distribution of scores
4 - 5	5
6 - 7	7
8 - 9	15
10 - 11	43
12 - 13	8
14 - 15	2

APPENDIX J

The Results for the Second-Level Factors in the MAIN FAMILIAR SAMPLE

GRAPH OF LATENT ROOTS AGAINST FACTOR NUMBERS FOR THE SECOND LEVEL FACTOR ANALYSIS IN THE MAIN FAMILIAR SAMPLE (N = 80) (SEE CHAPTER 4 FOR THE OTHER RESULTS OF THE ANALYSIS)



Scores for the Second-level factors and the independent variables

	Q6							F_A	F_B	F'_A	F'_B	Q11	Q12
	.A	.B	.1	.2	.3	.4	.5						
1011	2	1	1	1	2	1	2	.17151570	-.35697710	-.33606140	-.33577410	49	216
1021	2	1	1	1	2	1	2	.37938800	-1.1094570	1.2415865	-1.4092799	44	228
1031	2	1	2	2	1	2	1	.43496180	-.49256360	-1.1622402	-.92205870	47	200
1041	1	2	2	2	2	2	2	.03657380	.16413470	-.01525220	.20097880	44	192
1051	2	1	1	1	2	2	2	.83579540	.68373630	-1.3357780	1.4230796	45	228
1061	2	1	1	2	2	1	2	.95300350	.27489100	.96839200	-.14034600	38	226
1081	2	1	2	2	1	2	2	.64712110	-1.0823820	1.6551001	-1.4835775	49	202
1091	2	1	2	2	1	1	2	-.19176360	.47818900	-.68948680	.59183510	50	189
1101	1	1	2	2	2	2	1	.70334370	-.25591740	1.1123100	-.38530580	42	212
1111	1	1	2	2	1	1	2	.26339970	.50650770	.38218890	.73773160	51	220
1121	1	2	2	1	2	2	1	-2.0989290	.07235200	-4.2198017	.27527630	31	138
1141	2	1	1	1	2	1	1	-.10076510	-.47586140	.00549320	-.53120230	44	177
1151	2	1	2	1	2	2	1	-.69365390	.13260060	-1.1569645	.25051040	35	157
1161	2	1	2	2	2	2	1	.31260620	-.83365300	.26813650	-1.2881493	40	229
1171	2	1	1	1	2	1	2	-.37772720	-.57976810	-.55825790	-.72663050	44	199
1181	2	1	2	2	2	1	2	-.39547300	2.2082710	-.75424780	3.4241948	28	136
1201	1	2	1	1	2	2	2	1.0528120	-1.1436390	2.4273146	-1.8249022	38	217
1211	1	2	1	1	2	2	2	.52851290	.18058310	.74088990	.20097880	38	197
1221	1	2	1	1	2	2	1	-1.1280710	.88735620	-2.1674781	1.5689761	38	123
1231	1	2	1	1	2	1	2	-.79742380	-.10191720	-1.7332192	-.31100830	42	204
1241	2	2	2	2	2	2	1	-.97788460	-.45650420	-2.0343569	-.84776120	48	198
1271	2	1	2	2	2	2	1	-.08516620	-.06115730	.51506440	.25051040	27	192
1281	2	2	2	2	2	2	1	.51627210	-.81888670	1.3188211	-1.0927211	45	184
1291	2	2	2	2	1	1	2	.00191920	.06011040	.54828320	.42117280	39	171
1301	2	2	1	2	1	1	2	-.25030280	-.77381620	-.26602470	-.87252700	50	186
1311	2	2	1	1	2	1	2	-.90528320	.67850300	-1.7979802	1.0074574	41	179
1321	1	1	2	1	2	1	2	3.6884370	1.1213680	7.9429127	2.1304949	67	260
1331	2	1	1	2	1	2	1	-.23878030	.92400900	-.93833700	1.3735480	40	220
1351	1	2	1	1	2	1	2	-.77844720	-.53468290	-1.7664380	-.89729290	44	220
1371	1	2	1	1	2	2	2	1.0183300	.44146780	2.4184401	.95792570	40	204
1381	1	2	2	1	2	2	2	.00860550	-.82844380	.28228670	-1.2881493	51	190
1391	1	2	2	1	2	2	2	.60592660	-.66256760	1.4519423	-1.0927211	40	196
1411	1	2	1	1	2	2	2	2.2389840	1.4797960	4.3639091	2.0809632	44	194
1421	1	2	2	1	1	1	2	.13802510	1.2953930	.00741550	1.9350667	56	212
1431	1	2	2	1	2	1	2	-.04693390	-.03685190	.52418460	.07984810	30	153
1441	1	1	1	1	2	1	2	-1.2259880	.36056050	-2.1550045	.44593860	49	195
1451	1	1	2	1	2	2	1	-.64114860	.31293370	-1.0606613	.64136690	58	172
1461	1	2	2	1	2	2	1	-.23032610	.40511290	-.42516680	.64136690	43	193
1471	2	2	2	1	2	1	2	-.33599910	.19953790	-.45478670	.44593860	39	166
1481	1	1	1	1	2	1	1	-.43792890	-.22899810	-1.4633779	-.92205870	48	233
1491	2	2	1	1	2	2	1	-.34914180	-.56822260	-.92058790	-.94682460	42	180
1501	2	2	1	1	2	1	2	-.90390620	1.6851990	-2.0343569	2.6672478	39	165
1521	1	1	2	1	2	1	2	.46531410	-.18621020	.59721760	-.31100830	40	219
1531	1	2	2	2	2	1	2	-.11764020	-.38985970	-.36400460	-.53120230	47	201
1541	2	1	2	1	2	1	1	-.22141200	-.50925760	-.43236470	-.53120230	53	225
1561	2	1	2	1	2	1	1	-.69071200	.08263280	-1.5912234	-.14034600	34	179
1571	2	2	1	1	2	1	2	-1.1747610	1.1782490	-2.1027169	1.9598325	38	132
1581	2	2	1	1	2	2	2	-.00350830	.20948540	-.20126360	.25051040	44	176
1591	2	2	1	1	2	2	1	-.80960790	-.08626420	-2.2463893	-.31100830	40	202
1601	2	2	1	1	2	1	2	-1.1767960	.20061590	-2.5718714	.10461400	44	180
1611	2	1	1	2	2	2	2	.02559120	.02576630	-.09248680	-.11558010	39	200
1621	2	1	2	2	2	1	1	.30079140	-.02419220	.63931100	.22574460	37	205
1631	2	1	2	2	2	1	2	.82179970	-1.5665150	1.4746099	-2.5818491	46	213

1651	2	1	1	2	2	1	1	.95860250	-.63625690	-1.8716159	-.87252700	48	235
1661	2	2	2	1	2	2	2	.98929970	.45099540	1.7054654	.64136690	43	199
1671	1	1	2	2	1	1	2	.08305270	-1.2469850	.46769540	-1.6294740	56	223
1681	1	2	2	2	1	1	2	.05040520	-.53390900	-.16252350	-.92205870	46	189
1691	1	1	1	2	1	2	2	.18756440	1.2672150	-.87657210	1.1533539	22	193
1701	2	2	2	1	2	1	2	.87768040	-1.1642920	2.0544635	-1.8496680	28	214
1711	2	1	1	1	2	2	2	.13498530	.20288570	-.16252350	.42117280	47	175
1721	1	1	2	2	2	1	2	.26426500	.11377860	.31215220	.05508220	34	185
1731	1	1	1	1	2	1	1	.04332080	-.35397010	-.25522780	-.89729290	56	206
1741	2	1	1	2	2	2	2	.35273610	-.40349750	1.9316479	-.11558010	35	173
1751	2	2	2	2	2	2	1	1.1153730	.49308130	2.5183423	.86156090	40	190
1761	2	1	2	1	2	2	2	.08942320	-.78184800	-.58623120	-1.7285374	57	217
1771	2	1	1	1	2	1	2	.97848300	.17395320	1.9789055	.39640690	35	209
1781	1	2	1	1	2	1	2	.40195100	-.73156960	.89008350	-1.3129151	54	210
1791	1	2	1	1	2	1	2	1.3008110	-.49211090	3.1294924	-.84776120	40	185
1801	1	2	2	1	2	1	1	.46859820	-.02702270	-.44951110	.05508220	55	206
1811	2	1	1	1	2	2	2	.59194920	1.3156730	1.2543057	2.0809632	48	163
1821	2	2	2	1	2	1	2	1.4103310	1.0576530	2.0489422	1.4699128	37	150
1831	2	2	1	1	2	1	2	.40798260	.47231470	-1.0399159	.81202920	34	174
1841	1	2	1	1	2	2	2	.17796820	-.51578580	-.69836130	-.92205870	37	186
1851	2	2	2	2	2	2	2	.50454970	.96509490	-1.2621424	1.3487821	42	198
1871	2	2	2	2	2	2	1	.45822070	.29575720	.16295860	.20097880	42	221
1881	1	2	1	1	2	1	2	.54524060	-.15173730	-.31639000	.05508220	42	174
1891	2	1	1	1	2	1	2	.33406860	-.16196190	-.76312240	-.33577410	36	195
1921	2	2	2	2	2	2	2	.91697890	-1.3595120	-1.2917623	-1.8991997	52	240
1931	2	2	2	2	1	2	2	.33646320	-.17038210	-.79106570	-.53120230	48	184
1941	2	2	1	2	1	1	2	.15981400	-.16204190	.23491760	-.14034600	51	192

APPENDIX J (continued)

FREQUENCY DISTRIBUTIONS OF F'_A AND F'_B SCORES FOR THE MAIN FAMILIAR SAMPLE (n = 80)

F'_A Scores	Frequency distribution of scores
-8.8 to -6.7	1
-6.6 to -4.5	0
-4.4 to -2.3	5
-2.2 to 0	29
0 to 2.2	43
2.3 to 4.4	2

F'_B Scores	Frequency distribution of scores
-3.6 to -2.5	1
-2.4 to -1.3	10
-1.2 to 0	29
0 to 1.2	28
1.3 to 2.4	10
2.5 to 3.6	2

Note: F'_A = Support for the design, content, and teaching requirements of the NEW CURRICULUM (the direction for scoring the factor was reversed here; see Chapter 4)

F'_B = Belief in the professional competence of teachers for initiating and implementing curriculum innovation.

Frequency distribution of scores for Experience of Bureaucracy (Q11) in the MAIN FAMILIAR SAMPLE

Scores	Frequency distribution of scores
22 - 29	4
30 - 37	11
38 - 45	37
46 - 53	20
54 - 61	7
62 - 69	1

Frequency distribution of scores for Dogmatism (Q.12)

Scores	Frequency distribution of scores
123 - 145	4
146 - 168	6
169 - 191	21
192 - 214	31
215 - 237	16
238 - 260	2

APPENDIX J (continued)

Matrix of the Product-Moment Intercorrelations of "Dependent" and "Independent" variables for the MAIN FAMILIAR SAMPLE (n=80)

	Independent Variables									Dependent Variables	
	BACKGROUND INFORMATION Variables					KNOWLEDGE of Curriculum Innovation Variables		Organ-ization Variable	PERSON-ALITY Variable	Second-level factors of attitude to curriculum innovation	
	Q6.A	Q6.B	Q6.1	Q6.2	Q6.3	Q6.4	Q6.5	Q.11	Q.12		
	(TYPE of Polytechnic)	(SIZE of Polytechnic)	(Present Position)	(Teaching Experience)	(Professional Training)	(FAMILIARITY)	(Attendance on a CRASH COURSE)	(Experience of Bureaucracy)	(Dogmatism)	F'_A	F'_B
Q6.A	-										
Q6.B	-.194	-									
Q6.1	-.049	-.041	-								
Q6.2	.230	-.188	.247	-							
Q6.3	-.014	.067	-.087	-.484	-						
Q6.4	.041	.106	-.080	.137	.069	-					
Q6.5	-.089	.159	-.157	-.095	-.140	-.268	-				
Q.11	-.148	-.081	.069	-.038	-.197	-.102	.001	-			
Q.12	-.074	-.301	.067	.167	-.068	-.066	-.006	.451	-		
F'_A	-.133	-.066	.194	.029	.032	.007	.253	.138	.311	-	
F'_B	.020	.040	-.009	-.125	.009	.001	.080	-.190	-.421	.006	-

NOTE: a. see text for the dichotomisation of the categorical variables, the scoring procedures and the corrections made where necessary to these correlation coefficients

b. F'_A = Support for the design, content and teaching requirements of the NEW CURRICULUM.

F'_B = Belief in the professional competence of teachers for initiating and implementing curriculum innovation.

APPENDIX J (continued)

SUMMARY OF THE STEPWISE REGRESSION ANALYSES WITH THE SECOND-LEVEL FACTORS OF ATTITUDE TO CURRICULUM INNOVATION AS DEPENDENT VARIABLES .

A. F'_A as dependent variable

STEP 1

Variable entered : Dogmatism.

Analysis of Variance Table

Source	df	Sum of Squares	Variance	F Ratio
Regression on all variables	1	22.57693	22.57693	8.47230
Due to residual	78	210.33654	2.69662	
T O T A L	79	232.91348		

Variable	B	SE of B	B/SE of B	Partial Correlation
Dogmatism	-.0209	0.0072	2.8934	-0.3113

Constant = -4.0797
Multiple Correlation = 0.3113
Percentage goodness of fit = 9.6932

STEP 2

Variable entered : Attendance on a CRASH COURSE.

Analysis of Variance Table

Source	df	Sum of Squares	Variance	F Ratio
Due to regression on Attendance on a CRASH COURSE	1	15.18963	15.18963	5.99344
Regression on previous variables	1	22.57693		
Regression on all variables	2	37.76657	18.88328	7.45086
Due to residual	77	195.14691	2.53437	
T O T A L	79	232.91348		

Variable	B	SE of B	B/S E of B	Partial Correlation
Attendance on a CRASH COURSE	-0.9508	0.3884	2.4481	-0.2687
Dogmatism	-0.0210	0.0070	2.9996	-0.3234

Constant = -5.7167
Multiple Correlation = 0.4026
Percentage goodness of fit = 16.2148
No more variables found to be significant.
Stepwise Regression procedure completed.
Significance level to enter variables = 5 per cent.
Significance level to remove variables = 5 per cent.

B. F'_B as dependent variable

STEP 1

Variable entered : Dogmatism.

Analysis of Variance Table

Source	df	Sum of Squares	Variance	F Ratio
Regression on all variables	1	18.42390	18.42390	16.85151
Due to residual	78	85.27806	1.09330	
T O T A L	79	103.70196		

Variable	B	SE of B	B/SE of B	Partial Correlation
Dogmatism	-.0189	0.0046	4.1050	-0.4214

Constant = 3.6854
Multiple correlation = 0.4214
Percentage goodness of fit = 17.7661
No more variables found to be significant.
Stepwise Regression procedure completed.
Significance level to enter variables = 5 per cent
Significance level to remove variables = 5 per cent

APPENDIX J (continued)

Matrix of the product-moment correlations between each of the second-level factors of attitude to curriculum innovation and each of the three different dimensions of Dogmatism for the MAIN FAMILIAR SAMPLE in India (n=80).

The Second-level factors of attitude to curriculum innovation	The dimensions of Dogmatism (Q.12)		
	The belief-disbelief dimension (Q.12A)	The central-peripheral dimension (Q.12B)	The time-perspective dimension (Q.12C)
F'_A	-.265*	-.277*	-.301**
F'_B	-.258*	-.399**	-.368**

* significant at the five per cent level ($P_{.05}$ = .217, df = 80)

** significant at the one per cent level ($P_{.01}$ = .283, df = 80)

NOTE:

F'_A = Support for the design, content and teaching requirements of the NEW CURRICULUM.

F'_B = Belief in the professional competence of teachers for initiating and implementing curriculum innovation.

THE DESCRIPTIVE STATEMENTS FOR THE VARIABLES (F'_A) AND (F'_B) (WHICH REPRESENTED THE SECOND-LEVEL FACTORS OF ATTITUDE TO CURRICULUM INNOVATION, F_A AND F_B, RESPECTIVELY)

1. The marker variables for F'_A arranged in descending order of their factor loadings on F_A

(F_A = Support for the design, content and teaching requirements of the NEW CURRICULUM)

Composite Variables representing First-level factors	Statements
f_8	The test questions for some of the topics studied in the TTTI materials require additional information often not directly related to the topics. When I meet with difficulties in using the TTTI materials I tend to think that it is the fault of the materials rather than my own fault. I feel that the teaching techniques recommended in the TTTI materials should also be applied to the teaching of other subjects in the engineering course. The TTTI materials are too costly in their present form for Polytechnic students. Students should derive the greatest benefit if materials similar to the TTTI materials are prepared for the whole of the three years of the course (in engineering drawing). The TTTI materials should give practice in the basic skills of engineering drawing through many more exercises. It's wrong for the TTTI materials to put the same degree of emphasis on drafting skills for all technician students. Some of the topics dealt with in the TTTI materials are made difficult merely for the sake of using different teaching techniques. The innovators do not seem concerned with day-to-day problems of classroom teaching.

f_4	The course materials used do not motivate students to study on their own because the language used is too difficult. The course materials contain too many details and students get rather confused. The course materials used arouse no interest in the students.
f_7	I should be given more preparation time at work in order to make the teaching aids necessary to use the TTTI materials properly. The test papers should be attached to the teachers' support materials and <u>not</u> to the students' support materials. Classes in the Polytechnics are too big to implement the TTTI curriculum innovation successfully. The TTTI materials seem to be designed to develop the right balance in the skills of reading and preparing actual drawings. Students using the TTTI materials do not think of their course in terms of examination success only. The TTTI materials help students to become skilful in the use of engineering drawing instruments. I feel that I have been given all the facilities to use the TTTI materials. The TTTI materials should not be biased towards mechanical engineering. The only reason why the TTTI materials have prestige value is that these materials are of good quality. Students feel that the TTTI materials are so well prepared that they can readily get on with the work in class. Students welcome exercises of the completion type.

2. <u>The marker variables for F'_B arranged in descending order of their factor loadings on F_B</u>

(F_B = Belief in the professional competence of teachers for initiating and implementing curriculum innovation)

Composite Variables representing first-level factors	Statements
f_9	I should have plenty of guidance from TTTI in the preparation of teaching aids, to implement the materials. The trouble with having all these TTTI materials is that I feel that I cannot add any information of my own or give exercises of my own. The TTTI materials give me confidence in my teaching.
f_1	It is a waste of time for the instructor/lecturer to try new ideas unless the head of department approves of them. Instructors/lecturers have so much work that they have no time for curriculum innovation. There is no incentive for the instructor/lecturer to initiate curriculum innovation. Curriculum innovation should be the responsibility of Polytechnic instructors/lecturers. It is for teacher-trainers, (lecturers at the TTTI's) to find out what is wrong with the curriculum of Polytechnic courses (in engineering)

APPENDIX K

The Results of the Analyses in the

MAJOR NON-FAMILIAR SAMPLE

and in the

COMBINED GROUP (of FAMILIAR and NON-FAMILIAR teachers)

APPENDIX K

RESULTS OF THE PRINCIPAL COMPONENTS ANALYSIS OF THE INTER-ITEM CORRELATIONS OF Q7 IN THE MAJOR NON-FAMILIAR SAMPLE (n = 54)

A. Matrix of the product-moment inter-correlations of the items of questionnaire Q7

	Q7 Item Numbers																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	-																
2	.801	-															
3	.270	.243	-														
4	.091	.209	.298	-													
5	-.060	-.098	.111	.184	-												
6	.185	.246	.108	-.066	-.085	-											
7	.219	.242	.063	.070	-.279	.123	-										
8	-.064	.076	.157	-.018	.056	.175	.172	-									
9	.277	.267	-.118	-.152	-.441	-.062	.245	.071	-								
10	-.047	-.129	.132	.007	.151	-.213	-.083	.184	.036	-							
11	.138	.027	-.125	-.194	-.088	-.129	.330	-.003	.181	-.053	-						
12	.325	.342	.173	.113	.226	-.046	.003	-.379	.086	.153	.030	-					
13	-.312	-.195	-.104	-.026	-.068	-.356	-.114	.216	-.065	.184	.105	-.261	-				
14	.029	.053	.278	.283	.049	-.053	-.054	-.259	-.063	.130	-.040	.436	-.001	-			
15	.102	.118	-.089	-.018	-.355	.011	.163	-.061	.021	-.312	.205	-.178	-.114	-.088	-		
16	-.133	-.037	-.245	-.143	-.459	.256	.141	.005	.214	-.148	.246	-.109	-.016	-.004	.197	-	
17	-.057	.068	-.217	-.188	-.395	.256	.295	.350	.188	-.194	.101	-.340	-.057	-.149	.213	.398	-

B. Principal Components Matrix for Q7 Items (from the inter-item correlations in the MAJOR NON-FAMILIAR SAMPLE) (n = 54)

Variables (Q7 items)	Common Factor Loadings (unrotated)						
	I	II	III	IV	V	VI	VIII
1	.082	.843	.060	.137	-.274	.109	-.121
2	.143	.830	.173	.120	-.095	.188	-.190
3	-.342	.438	.385	.133	.328	.139	.155
4	-.379	.273	.177	-.080	.471	.370	-.139
5	-.688	-.057	.228	-.068	-.324	.009	.381
6	.300	.297	.465	-.430	.065	-.400	.182
7	.486	.324	.051	.289	.031	.101	.397
8	.238	-.156	.746	.424	.060	.002	.093
9	.444	.286	-.241	.443	-.077	-.241	-.404
10	-.363	-.105	.053	.611	.093	-.334	.003
11	.359	.066	-.381	.349	-.140	.239	.588
12	-.410	.585	-.410	.048	-.017	-.284	.144
13	-.063	-.499	-.033	.508	.217	.271	-.122
14	-.370	.295	-.312	.008	.653	-.124	.153
15	.472	.103	-.169	-.267	.088	.576	-.010
16	.615	-.070	-.226	-.120	.386	-.295	.110
17	.719	-.082	.251	-.025	.198	-.135	.042
Latent Root	3.026	2.686	1.656	1.55	1.23	1.185	1.009
% Common Variance	17.8	15.8	9.74	9.12	7.24	6.97	5.94

C. The coefficient of congruence ϕ (Tucker, 1951) for the composite variable (f_1) in the MAIN FAMILIAR and MAJOR NON-FAMILIAR samples

According to the formula, ϕ_{pq} between the pth factor in a factor analysis 1 and the qth factor in an analysis 2 was given by:

$$\phi = \frac{\sum_{j=1}^{n} 1ajp.2ajp}{\sqrt{\left(\sum_{j=1}^{n} 1ajp^2\right)\left(\sum_{j=1}^{n} 2ajp^2\right)}}$$

where aj = factor loading on the jth variable

n = number of variables.

The above formula was applied as follows for the congruence between the first factors in the two samples:

The coefficient of congruence ϕ for factors I:V (7A) and I:V (7A)'

Q7 Item No	Factor Loadings	
	1ajp	2ajq
	I:V (7A)'	I:V (7A)
1	.261	.239
2	.281	.108
3	-.324	.247
4	-.337	-.192
5	-.718	.155
6	.210	.073
7	.511	.244
8	-.040	.304
9	.551	.592
10	-.377	-.542
11	.461	.451
12	-.115	-.238
13	-.168	.082
14	-.177	-.095
15	.511	.190
16	.618	.699
17	.569	.555

$\sum$ 1ajp.2ajq = 1.703

$\sum 1ajp^2$ = 2.8858

$\sum 2ajq^2$ = 2.1007

$$\phi = \frac{1.703}{\sqrt{(2.8858)\ (2.1007)}} = \frac{1.703}{2.462} = .69$$

Similarly, the coefficient of congruence for the second factors I:V (7B) and I:V (7B)' was calculated thus:

Q7 Item No	Factor Loadings	
	1ajp	2ajq
	I:V (7B)'	I:V (7B)
1	.798	-.041
2	.813	-.386
3	.581	.577
4	.367	.463
5	.118	.575
6	.380	.519
7	.249	.277
8	.050	.079
9	.129	-.263
10	-.030	.145
11	-.108	.104
12	.482	.412
13	-.470	.359
14	.234	.522
15	-.024	.011
16	-.225	.159
17	-.104	-.016

$\sum$ 1ajp.2ajq = .560

$\sum$ 1ajp^2 = 3.0683

$\sum$ 1ajq^2 = 2.0787

$$\phi = \frac{.560}{\sqrt{(3.0683)\ (2.0787)}} = \frac{.560}{2.5254} = .22$$

The congruence between (f_1) in the MAIN FAMILIAR SAMPLE and the composite variable made up of the same five items (f_1)' in the NON-FAMILIAR SAMPLE was calculated in the same way thus:

Q7 Item Numbers	Factor Loadings		$\sum$1ajp. 2ajq	$\sum$1ajp^2	$\sum$2ajq^2
	1 ajp	2 ajq			
	(For the MAIN FAMILIAR SAMPLE	(For the NON-FAMILIAR SAMPLE)			
9	.592	.551	.326	.350	.304
10	-.542	-.377	.204	.294	.142
11	.451	.461	.208	.203	.212
16	.699	.618	.432	.489	.382
17	.555	.569	.316	.308	.324
			1.486	1.644	1.364

$$\phi = \frac{\sum 1ajp.2ajq}{\sqrt{\sum 1ajp^2)\ (\sum 2ajq^2)}} = \frac{1.486}{1.497} = .993$$

APPENDIX K (continued)

D. <u>The Inter-Item Correlations for the Composite Variable (f_1) in the MAJOR NON-FAMILIAR SAMPLE (n=54) (and in the MAIN FAMILIAR SAMPLE (n=80))</u>

	Q7 Item Numbers Representing f_1				
	9	10	11	16	17
9	-				
10	.036 (.120)	-			
11	.181 (.159)	.053 (.153)	-		
16	.214 (.243)*	.148 (.316)**	.246 (.157)	-	
17	.188 (.208)	.194 (.267)*	.101 (.136)	.398** (.307)**	-

* Significant at the 5 per cent level

** Significant at the 1 per cent level

(NOTE: a. the correlations in the MAIN FAMILIAR SAMPLE were those in brackets

b. the alpha coefficient was .52 for the MAJOR NON-FAMILIAR SAMPLE).

Data for the Stepwise Regression Analysis

	Q6									
	6.A	6.B	6.1	6.2	6.3	6.4	6.5	f_1	Q11	Q12
1011	2	1	1	1	2	2	2	14	49	216
1021	2	1	1	1	2	2	2	16	44	228
1031	2	1	2	2	1	2	1	11	47	200
1041	1	2	2	2	2	2	2	13	44	192
1051	2	1	1	1	2	2	2	23	45	228
1061	2	1	1	2	2	2	2	15	38	226
1081	2	1	2	2	1	2	2	10	49	202
1091	2	1	2	2	1	2	2	15	50	189
1101	1	1	2	2	2	2	1	10	42	212
1111	1	1	2	2	1	2	2	12	51	220
1121	1	2	2	1	2	2	1	19	31	138
1141	2	1	1	1	2	2	1	13	44	177
1151	2	1	2	1	2	2	1	17	35	157
1161	2	1	2	2	2	2	1	11	40	229
1171	2	1	1	1	2	2	2	12	44	199
1181	2	1	2	2	2	2	2	22	28	136
1201	1	2	1	1	2	2	2	12	38	217
1211	1	2	1	1	2	2	2	13	38	197
1221	1	2	1	1	2	2	1	20	38	123
1231	1	2	1	1	2	2	2	16	42	204
1241	2	2	2	2	2	2	1	17	48	198
1271	2	1	2	2	2	2	1	17	27	192
1281	2	2	2	2	2	2	1	12	45	184
1291	2	2	2	2	1	2	2	16	39	171
1301	2	2	1	2	1	2	2	15	50	186
1311	2	2	1	1	2	2	2	19	41	179
1321	1	1	2	1	2	2	2	21	67	260
1371	1	2	1	1	2	2	2	15	40	204
1381	1	2	2	1	2	2	2	11	51	190
1391	1	2	2	1	2	2	2	12	40	196
1411	1	2	1	1	2	2	2	17	44	194
1421	1	2	2	1	1	2	2	20	56	212
1431	1	2	2	1	2	2	2	18	30	153
1441	1	1	1	1	2	2	2	18	49	195
1451	1	1	2	1	2	2	1	19	58	172
1461	1	2	2	1	2	2	1	19	43	193
1471	2	2	2	1	2	2	2	18	39	166
1481	1	1	1	1	2	2	1	11	48	233
1491	2	2	1	1	2	2	1	9	42	180
1501	2	2	1	1	2	2	2	20	39	165
1521	1	1	2	1	2	2	2	16	40	219
1531	1	2	2	2	2	2	2	13	47	201
1541	2	1	2	1	2	2	1	13	53	225
1561	2	1	2	1	2	2	1	15	34	179
1571	2	2	1	1	2	2	2	22	38	132
1581	2	2	1	1	2	2	2	17	44	176
1591	2	2	1	1	2	2	1	16	40	202
1601	2	2	1	1	2	2	2	20	44	180
1611	2	1	1	2	2	2	2	17	39	200
1621	2	1	2	2	2	2	1	15	37	205
1631	2	1	2	2	2	2	2	10	46	213
1651	2	1	1	2	2	2	1	15	48	235
1661	2	2	2	1	2	2	2	19	43	199

1671	1	1	2	2	1	2	2	13	56	223
1681	1	2	2	2	1	2	2	11	46	189
1691	1	1	1	2	1	2	2	16	22	193
1701	2	2	2	1	2	2	2	10	28	214
1711	2	1	1	1	2	2	2	16	47	175
1721	1	1	2	2	2	2	2	16	34	185
1731	1	1	1	1	2	2	1	13	56	206
1741	2	1	1	2	2	2	2	17	35	173
1751	2	2	2	2	2	2	1	22	40	190
1761	2	1	2	1	2	2	2	5	57	217
1771	2	1	2	1	2	2	2	14	35	209
1781	1	2	1	1	2	2	2	9	54	210
1791	1	2	1	1	2	2	2	17	40	185
1801	1	2	2	1	2	2	1	16	55	206
1811	2	1	1	1	2	2	2	17	48	163
1821	2	2	2	1	2	2	2	12	37	150
1831	2	2	1	1	2	2	2	18	34	174
1331	2	1	2	2	1	2	1	19	40	220
1351	1	2	2	1	2	2	2	13	44	220
1841	1	2	1	1	2	2	2	11	37	186
1851	2	2	2	2	2	2	2	17	42	198
1871	2	2	2	2	2	2	1	13	42	221
1881	1	2	1	1	2	2	2	16	42	174
1891	2	1	1	1	2	2	2	14	36	195
1921	2	2	2	2	2	2	2	6	52	240
1931	2	2	2	2	1	2	2	13	48	184
1941	2	2	1	2	1	2	2	15	51	192
3022	1	1	2	2	2	1	2	15	44	215
3032	1	1	2	2	2	1	2	15	44	205
3042	1	1	2	2	2	1	2	15	51	200
3072	1	1	2	1	2	1	2	20	43	163
3082	1	1	2	2	2	1	2	16	47	140
3092	1	1	2	2	2	1	2	15	43	178
3132	1	1	2	2	2	1	2	10	56	240
3142	1	1	2	2	2	1	2	10	55	235
3152	1	1	2	2	2	1	2	10	55	236
3172	2	2	2	1	2	1	2	14	40	210
3182	2	1	2	2	2	1	2	8	39	216
3192	1	2	2	2	2	1	2	15	43	221
3202	1	2	2	2	2	1	2	10	43	228
3212	1	2	2	2	2	1	2	17	39	204
3222	1	1	2	1	1	1	2	17	43	214
3232	1	1	2	2	1	1	2	15	41	216
3242	1	1	2	2	2	1	2	15	47	222
3272	1	2	2	2	2	1	2	14	51	218
3282	1	1	2	1	2	1	2	13	51	179
3292	1	1	2	1	2	1	2	8	46	215
3302	1	1	2	1	2	1	2	8	44	200
3312	1	1	2	1	2	1	2	17	37	143
3322	1	1	2	2	2	1	2	13	48	208
3342	2	1	2	1	2	1	2	15	50	147
3362	2	1	2	1	2	1	2	15	42	143
3392	1	1	2	1	2	1	2	15	55	248
3432	1	1	2	1	2	1	2	19	45	163
4012	2	2	2	1	2	1	2	14	55	197
4022	2	1	2	1	2	1	2	13	38	187
4032	2	1	2	1	2	1	2	16	33	175
4042	2	2	2	2	2	1	2	16	30	163
4052	2	2	2	2	2	1	2	14	42	207

4062	2	2	2	2	2	1	2	13	47	179
4072	2	2	2	2	2	1	2	12	40	153
4082	2	2	1	1	2	1	2	9	35	249
4102	2	1	2	1	2	1	2	15	38	138
4112	2	2	2	1	2	1	2	10	54	158
4132	2	2	2	2	2	1	2	14	48	218
4142	2	2	2	1	2	1	2	12	44	183
4152	1	1	2	2	1	1	2	14	34	175
4172	1	2	2	2	1	1	2	15	32	171
4202	1	1	2	2	1	1	2	14	53	237
4212	1	1	2	2	1	1	2	13	46	187
4222	1	2	1	1	2	1	2	14	54	169
4242	1	2	2	2	1	1	2	15	47	189
2032	1	2	2	2	2	1	2	14	42	239
2062	1	1	2	2	2	1	2	8	58	175
2072	1	1	2	2	2	1	2	8	58	175
2082	1	1	2	2	2	1	2	8	58	175
2092	1	1	2	1	1	1	2	14	45	172
2102	1	2	1	1	2	1	2	11	49	229
2122	1	2	2	2	2	1	2	17	49	194
2162	1	2	2	2	2	1	2	12	46	240
2182	1	1	2	2	1	1	2	10	45	193

APPENDIX K (continued)

The Frequency distribution of scores for Dogmatism in the MAJOR NON-FAMILIAR SAMPLE (n = 54)

Dogmatism scores	Frequency distribution of scores
130-150	5
150-170	6
170-190	14
190-210	9
210-230	12
230-250	8

The Frequency distribution of scores for Experience of Bureaucracy in the MAJOR NON-FAMILIAR SAMPLE (n = 54)

Scores	Frequency distribution of scores
30-35	4
35-40	6
40-45	15
45-50	14
50-55	7
55-60	8

The Frequency distribution of f_1 scores in the MAJOR NON-FAMILIAR SAMPLE (n = 54)

(f_1) Scores	Frequency distribution of scores
8-10	7
10-12	7
12-14	8
14-16	23
16-18	7
18-20	1
20-22	1

APPENDIX K (continued)

A. Summary of the Stepwise Regression Analysis with (f_1) as Dependent Variable

Step 1

Variable entered: Dogmatism

Analysis of Variance Table

Source	df	Sum of Squares	Variance	F
Regression on all variables entered	1	183.42752	183.42752	16.70539
Due to residual	132	1449.37817	10.98013	
TOTAL	133	1632.80569		
Variable	B	S.E. of B	B/S.E of B	Partial Correlation
Dogmatism	-.0426	0.0104	4.0872	- 0.3351

Constant = 22.6702

Multiple Correlation = 0.3351

Percentage goodness of fit = 11.2338

Step 2

Variable entered:: Familiarity

Analysis of Variance Table

Source	df	Sum of Squares	Variance	F
Due to regression on Familiarity	1	96.38868	96.38868	9.33260
Regession on previous variables	1	183.42752		
Regression on all variables entered	2	279.81622	139.90811	13.54627
Due to residual	131	1352.98950	10.32816	
TOTAL	133	1632.80566		
Variable	B	S.E. of B	B/S.E of B	Partial Correlation
Familiarity	1.7291	0.5660	3.0549	0.2578
Dogmatism	-.0.0424	0.0101	4.1902	-0.3437

Constant = 19.8617

Multiple Correlation = 0.4139

Percentage goodness of fit = 17.1370

No more variables were found to be significant

Significant level to enter variables: 5 per cent

Significant level to remove variables: 5 per cent

APPENDIX K (continued)

Matrix of the product-moment intercorrelations of dependent and independent variables for the COMBINED GROUP (n=134) (that is, the MAIN FAMILIAR SAMPLE and the MAJOR NON-FAMILIAR SAMPLE together)

	Independent Variables									Dependent Variable
	Background Information Variables					Knowledge of Innovation Variables		Organisation Variable	Personality Variable	The Composite Variable (f_1)
	Q6.A	Q6.B	Q6.1	Q6.2	Q6.3	Q6.4	Q6.5	Q11	Q12	
	Type of Polytech	Size of Polytech	Present Position	Teaching Exp.	Prof. Training	FAMILIARITY	Attendance CRASH COURSE	Experience of Bureau'cy	Dogmatism	
Q6.A	-									
Q6.B	.042	-								
Q6.1	-.143	-.143	-							
Q6.2	-.046	-.106	.382**	-						
Q6.3	.101	.101	-.150	-.342**	-					
Q6.4	.298**	.145	-.425**	-.219*	.005	-				
Q6.5	-.176*	.056	.000	.018	-.101	-.383**	-			
Q11	-.246**	-.128	.115	.045	-.057	-.165	.063	-		
Q12	-.150	-.100	.029	.208*	-.036	-.007	-.001	.339**	-	
(f_1)	.085	.085	-.178*	-.192*	.016	.245**	-.097	-.287**	-.335**	-

Note:

a. See text for the dichotomisation of the categorical variables, the scoring procedures and the corrections made where necessary to these correlation coefficients.

b. f_1 = Belief that teachers should take the initiative in curriculum innovation.

c. $P_{.01}$ = .228, df = 125 $P_{.05}$ = .174, df = 125

* Significant at the 5 per cent level. ** Significant at the 1 per cent level.

APPENDIX L

The PASS RATE in Engineering Drawing for 1973 after adjusting the PASS MARK

A. The Conversion of the Examination PASS MARK for the Post-Innovation YEAR 1973

SUMMARY STATISTICS					
Year 1972			Year 1973		
n	M_x	SD_x	n	M_y	SD_y
3051	53.24	19.59	3167	46.54	15.75

n = number of examination candidates.
M = mean percentage examination mark.

From the equation:

$$Y = M_y + \frac{SD_y}{SD_x} (X - M_x) \quad \text{(McIntosh, 1967)}$$

Where X = the official PASS MARK (ie 35%)

and Y = the converted PASS MARK,

$$Y = 46.54 + \frac{15.75}{19.59} \{35 - 53.24\}$$

$$= 32 \text{ (approx)}$$

B. The Relationship between PASS RATE and Examination Year with the PASS MARK for 1973 fixed at 32%

	Examination Year		
	Year 1972 (Pre-innovation) PASS MARK: 35%	Year 1973 (Post-innovation) PASS MARK: 32%	
Number of Passes	2453 (2469)	2578 (2562)	5031
Number of Failures	598 (582)	589 (605)	1187
	3051	3167	6218

$\chi^2 = 1.066$ (ns)

(Note: the expected frequencies are in brackets)

APPENDIX M

The analysis of responses about the TRADITIONAL CURRICULUM and the NEW CURRICULUM for teachers in the MAIN FAMILIAR SAMPLE

APPENDIX M

RESULTS OF THE FACTOR ANALYSIS OF THE TEACHERS' RESPONSES TO QUESTIONNAIRE Q8 ABOUT THE "OTHER EXISTING MATERIALS", THAT IS, THE TRADITIONAL CURRICULUM.

The results of the Principal Components analysis of the product-moment inter-item correlations for questionnaire Q8 (with reference to the TRADITIONAL CURRICULUM) are shown in Tables 1 and 2. Six factors with latent roots greater than 1 (Kaiser's criterion) were extracted and on the basis of the Scree Test, three factors were rotated. The results of the Varimax Rotation are given in Table (3a). Parallel results for the teachers' responses about the NEW CURRICULUM are also reproduced in Table 3(b) in order to facilitate the comparison of factor structures.

A study of the factor loadings for the first factor of the teachers' responses about the TRADITIONAL CURRICULUM (Table 3(a)) showed that for items 1,3,4,5,9,10, which made up the composite variable I:V(8A) (with reference to the NEW CURRICULUM), the factor loadings were all significant (Burt, 1947). However, items 2 and 11 had high and significant loadings also (.611 and .638, respectively) on the first factor.

The second factor in the teachers' responses to the TRADITIONAL CURRICULUM seemed to centre around the understanding of specifics in engineering and to correspond to the third factor rather than to the second factor of the teachers' responses about the NEW CURRICULUM. On the other hand, it was the third factor in the teachers' responses to the TRADITIONAL CURRICULUM which seemed to correspond to the second Factor (ie. I:V(8B)) of the teachers' responses about the NEW CURRICULUM, to judge from the factor loadings on items 16 and 17. It was therefore Factor III in Table 3(a) which was labelled I:V(8B)'. However, for I:V(8B)', item 7 was not linked to the idea underlying I:V(8B), namely, that the curriculum (course) materials did not motivate students to study. It did not seem that in considering the TRADITIONAL CURRICULUM the teachers perceived item 7 as being related to the lack of motivation to study. Instead, what was associated with lack of motivation (Factor III) was the absence of an attempt in the course materials "to show the application of general principles of engineering drawing to specific jobs in industry" (item 12) and the lack of "sufficient guidance" from teachers on how "to learn properly from the course materials used" (item 15). The loadings for these two items (12 and 15) on Factor III were high and significant (0.572 and 0.571, respectively).

1. Matrix of the Product-moment inter-correlations of the items of questionnaire Q8 with reference to the TRADITIONAL CURRICULUM for the MAIN FAMILIAR SAMPLE (n = 80)

	Q8 Item Numbers																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	-																
2	.425	-															
3	.390	.516	-														
4	.234	.382	.434	-													
5	.277	.229	.393	.501	-												
6	.115	.227	.064	.068	.156	-											
7	.018	-.106	-.079	.001	.072	.074	-										
8	.190	.195	.219	.155	.221	.308	.038	-									
9	.188	.222	.361	.334	.299	-.016	.047	.151	-								
10	.245	.282	.297	.277	.275	-.025	-.113	.219	.314	-							
11	.114	.305	.202	.315	.254	.019	-.396	.040	.254	.335	-						
12	.213	-.003	-.265	-.241	-.297	-.038	-.056	-.383	-.351	-.250	.002	-					
13	-.273	-.048	-.114	.137	.219	-.129	-.235	-.085	.172	.016	.168	.106	-				
14	-.455	-.256	-.245	-.100	-.263	-.111	.055	-.189	-.183	-.249	-.069	.207	.231	-			
15	-.034	-.186	-.110	-.158	-.086	-.137	-.051	-.239	-.318	-.132	-.128	.286	.263	.178	-		
16	-.104	.024	-.245	-.189	-.084	-.112	.224	-.153	-.056	-.081	-.159	.403	.175	.116	.259	-	
17	-.049	-.327	-.216	-.284	-.075	-.080	.232	-.079	-.291	-.304	-.212	.468	.049	.182	.422	.527	-

2. Principal Components matrix for Q8 items from the inter-item Correlations in the MAIN FAMILIAR SAMPLE (n = 80) with reference to the TRADITIONAL CURRICULUM

Variables (Q8 items)	COMMON FACTOR LOADINGS (Unrotated) I	II	III	IV	V	VI
1	.526	-.175	.473	-.305	-.243	.186
2	.598	.148	.312	.372	.162	-.347
3	.675	.078	.230	-.087	-.104	.055
4	.624	.299	.103	.225	.087	-.042
5	.569	.240	.315	.366	.109	.258
6	.228	-.305	.178	-.086	.774	-.013
7	-.133	-.450	.428	.533	-.095	-.276
8	.443	-.306	.109	.195	.400	.218
9	.567	.180	-.022	.389	-.220	-.316
10	.562	.204	.016	-.025	-.222	-.025
11	.437	.543	-.161	-.268	.140	-.099
12	-.567	.321	.289	-.406	.163	-.295
13	-.090	.745	-.081	.358	.182	.140
14	-.482	.251	-.245	.275	.263	-.166
15	-.446	.358	.332	-.091	-.077	.532
16	-.429	.246	.590	.116	-.059	-.350
17	-.587	.078	.599	.082	.030	.153
Latent Root	4.182	1.887	1.700	1.374	1.141	1.025
% Common Variance	24.6	11.1	10.0	8.08	6.71	6.03

3(a) Varimax analysis of the items of questionnaire Q8 with reference to the TRADITIONAL CURRICULUM for the MAIN FAMILIAR SAMPLE of Teachers (n = 80)

Variables (Q8 items)	Rotated Factor Loadings I	II	III	Communality (h^2)%
1	.392	-.596	.150	53.1
2	.611	-.312	.072	47.7
3	.617	-.362	-.050	51.4
4	.686	-.113	-.077	48.9
5	.644	-.231	.112	48.0
6	.029	-.418	-.024	17.6
7	-.298	-.475	.298	40.4
8	.187	-.488	-.171	30.2
9	.549	-.119	-.197	35.4
10	.566	-.116	-.155	35.8
11	.638	.280	-.162	51.2
12	-.206	.373	.572	50.8
13	.357	.641	.178	57.0
14	-.272	.527	.053	35.5
15	-.082	.325	.571	43.8
16	-.091	.112	.756	59.3
17	-.314	.055	.780	71.0
Percentage Variance	19.4	13.8	12.5	

NOTE: Factor I was designated as IV:8A' in the text and Factor III as IV:8B'

3(b) Varimax analysis of the items of questionnaire Q8 with reference to the NEW CURRICULUM for the MAIN FAMILIAR SAMPLE of teachers (n = 80)

Variables (Q8 items)	Rotated Factor Loadings I	II	III	Communality (h^2) %
1	.535	-.182	.356	44.6
2	.177	-.224	.472	30.5
3	.551	-.366	.183	47.2
4	.729	-.063	-.157	56.1
5	.612	-.095	-.228	43.6
6	.326	.016	-.247	16.8
7	.071	.649	.263	49.6
8	.252	-.113	.458	28.6
9	.626	-.372	-.049	53.3
10	.441	.031	.010	19.6
11	-.001	-.000	.182	3.3
12	.133	.350	-.348	26.1
13	.149	.445	-.567	54.2
14	-.260	.408	-.214	28.0
15	.309	.316	-.470	41.7
16	.113	.711	.316	61.8
17	.122	.603	.359	50.7
Percentage Variance	14.8	13.3	10.4	

NOTE: Factor I was I:V (8A)

Factor II was I:V (8B)

4. THE INTER-ITEM CORRELATIONS FOR THE COMPOSITE VARIABLES IN THE MAIN FAMILIAR SAMPLE (n = 80)

FOR I:V (8A) AND (8A)' (CORRELATIONS FOR I:V(8A)' ARE IN BRACKETS)

	Q8 Item Numbers					
	4	9	5	3	1	10
4	-					
9	.329 (.334)	-				
5	.391 (.501)	.325 (.299)	-			
3	.311 (.434)	.514 (.361)	.218 (.393)	-		
1	.254 (.234)	.355 (.188)	.240 (.277)	.240 (.390)	-	
10	.359 (.277)	.097 (.314)	.193 (.275)	.08 (.297)	.173 (.245)	-

For I:V (8B) and I:V(8B)' (Correlations for I:V (8B)' are in brackets

	Q8 Items		
	7	16	17
7	-		
16	.376 (.224)	-	
17	.374 (.231)	.328 (.527)	-

5. COEFFICIENTS OF CONGRUENCE BETWEEN THE FIRST-LEVEL FACTORS EXTRACTED FROM THE FAMILIAR (MAIN SAMPLE) TEACHERS' RESPONSES TO QUESTIONNAIRE (Q8) ABOUT THE NEW CURRICULUM AND THOSE EXTRACTED FROM THEIR RESPONSES TO THE SAME QUESTIONNAIRE ABOUT THE TRADITIONAL CURRICULUM (SEE TEXT)

ϕ for IV:8A and IV:8A' when both were represented by the same items which composed (f_3)

Q8 Item No.	Factor Loadings				
	1ajp(IV:8A)	2ajq(IV:8A)'	$\sum$1ajp.2ajq	$\sum 1ajp^2$	$\sum 2ajq^2$
4	.729	.686	.500	.531	.470
9	.626	.549	.344	.392	.301
5	.612	.644	.394	.374	.415
3	.551	.616	.339	.304	.379
1	.535	.391	.209	.286	.153
10	.441	.566	.249	.194	.320
			2.035	2.081	2.038

$$\phi = \frac{\sum 1ajp.2ajq}{\sqrt{(\sum 1ajp^2)(\sum 2ajq^2)}}$$

$$= \frac{2.035}{\sqrt{(2.081)(2.038)}}$$

$$= \underline{0.988}$$

ϕ for I:V (8B) and I:V (8B)' when both were represented by the same items which composed (f_4)

Q8 Item No.	Factor Loadings				
	$1ajp$(IV:8B)	$2ajq$(IV:8B)'	$\Sigma 1ajp.2ajq$	$\Sigma 1ajp^2$	$\Sigma 2ajq^2$
16	.711	.756	.382	.505	.571
7	.649	.297	.193	.421	.088
17	.603	.780	.470	.364	.608
			1.045	1.290	1.267

$$\phi = \frac{\sum 1ajp.2ajq}{\sqrt{(\sum 1ajp^2)(\sum 2ajq^2)}} = \frac{1.045}{\sqrt{(1.290)(1.267)}} = \underline{0.817}$$

6. APPENDIX M (Continued)

f3 and f4 factor scores for the teachers' attitudes to the TRADITIONAL CURRICULUM and to the NEW CURRICULUM for teachers in the MAIN FAMILIAR SAMPLE (n = 80)

CODE NOS	TRAD f3	TRAD f4	New f3	New f4
1011	26	11	27	10
1021	21	5	26	7
1031	15	9	25	14
1041	17	9	25	12
1051	15	11	29	12
1061	19	8	12	8
1081	17	9	25	12
1091	19	7	28	9
1101	22	9	27	12
1111	20	11	25	12
1121	7	7	28	14
1141	13	9	27	10
1151	15	8	26	13
1161	18	7	26	11
1171	22	6	28	10
1181	25	11	23	12
1201	24	10	22	8
1211	19	8	22	9
1221	13	11	28	12
1231	15	10	22	12
1241	15	9	23	13
1271	21	12	27	8
1281	19	9	27	8
1291	18	7	27	7
1301	16	9	29	9
1311	18	9	23	12
1321	27	15	22	3
1331	20	6	23	12
1351	19	7	26	13
1371	20	9	25	8
1381	14	8	24	10
1391	16	10	21	9
1411	20	10	15	7
1421	20	12	23	13
1431	12	7	27	13
1441	14	9	23	13
1451	14	5	28	14
1461	14	9	24	11
1471	19	12	28	13
1481	14	15	17	15
1491	16	10	28	12
1501	17	9	26	13
1521	22	9	22	10

CODE NOS	TRAD f3	TRAD f4	NEW f3	NEW f4
1531	20	9	26	10
1541	15	9	29	9
1561	20	10	22	13
1571	18	13	24	12
1581	21	7	20	9
1591	23	13	23	13
1601	22	12	22	15
1611	21	9	21	11
1621	18	10	28	9
1631	26	5	21	10
1651	20	8	27	12
1661	22	6	18	5
1671	22	9	28	10
1681	18	9	24	12
1691	24	12	12	14
1701	17	9	23	12
1711	25	12	25	12
1721	25	14	24	13
1731	15	8	20	12
1741	21	7	28	4
1751	24	7	22	10
1761	18	9	20	10
1771	22	9	24	9
1781	26	10	23	12
1791	22	12	18	8
1801	24	13	26	12
1811	20	10	25	13
1821	23	10	22	8
1831	21	9	25	12
1841	19	12	24	12
1851	16	5	22	12
1871	22	8	19	10
1881	20	10	29	13
1891	15	8	23	12
1921	22	12	30	14
1931	24	12	20	12
1941	20	10	26	12

APPENDIX M (Continued)

<u>Cross-classification of teachers' attitudes to the TRADITIONAL CURRICULUM and to the NEW CURRICULUM on the basis of their f_3 scores</u>

		Attitudes to the TRADITIONAL CURRICULUM			
		Positive (Scores > 19)		Negative Scores ≤ 19)	
		CODE NO	CODE NO	CODE NO	CODE NO
Attitudes to the NEW CURRICULUM	Positive (Scores) (> 19)	1011*	1631	1031*	*1431
		1021	1651	1041*	*1441
		1101	1671	1051	*1451
				1081	
		1111*	*1711	1091*	*1461
		1171	*1721	1121*	1471
		1181*	1741	1141*	1491
		1201	1751	1151*	*1501
		1271	1771	1161*	1541
		1321	*1781	1211	1571
		1331	*1801	1221	1621
		1371	*1811	1231	*1681
		1421*	1821	1241*	*1701
		1521	1831	1281	*1731
		1531	1871	1291	*1761
		1561*	*1881	1301	1841
		1581	*1921	1311*	*1851
		1591*	*1931	1351*	*1891
		1601*	*1941	1381*	
		1611	(37)	1391	(37)
	Negative (Scores) (≤ 19)	1061	1691	1481	
		1411*	1791*		
		1661	(5)		(1)

<u>Note</u> Minimum possible f_3 score = 6. Maximum possible f_3 score = 30. Mean score for the TRADITIONAL CURRICULUM = 19.31 (n = 80); standard deviation = 3.941.
Mean score for the NEW CURRICULUM = 24.01 (n = 80); standard deviation = 3.668.

* Teachers who were in the same cell for both factors of attitude (as measured in this case by f_3).

APPENDIX M (Continued)

Cross-classification of teachers' attitudes to the TRADITIONAL CURRICULUM and to the NEW CURRICULUM on the basis of their f_4 scores.

		Attitudes to the TRADITIONAL CURRICULUM				
		Positive (Scores > 9)		Negative (Scores ≤ 9)		
		CODE NO	CODE NO	CODE NO	CODE NO	CODE NO
Attitudes to the NEW CURRICULUM	Positve (Scores) (> 9)	1011* 1051 1111* 1181* 1221 1231 1421* 1471 1481 1491 1561* 1571 1591*	*1601 1691 *1711 *1721 *1781 *1801 *1811 1841 *1881 *1921 *1931 *1941 (25)	*1031 *1041 *1091 1101 *1121 *1141 *1151 *1161 1171 *1241 *1311 1331 *1351	*1381 *1431 *1441 *1451 *1461 *1501 1521 1531 1611 1631 1651 1671 *1681	*1701 *1731 1751 *1761 1831 *1851 1871 *1891 (34)
	Negative (Scores) (≤ 9)	1201 1271 1321 1391 1411*	1621 1791* 1821 (8)	1021 1061 1081 1211 1281	1291 1301 1371 1541 1581	1661 1741 1771 (13)

Note Minimum possible f_4 score = 3. Maximum possible f_4 score = 15.
Mean score for the TRADITIONAL CURRICULUM = 9.337; standard deviation = 2.255.
Mean score for the NEW CURRICULUM = 10.912; standard deviation = 2.403.

* Teachers who were in the same cell for both factors of attitude (as measured in this case by f_4).

APPENDIX N

The Raw Scores and the Results of the Analysis for the ENGLISH SAMPLE

RAW Scores for the Secondary School Teachers of Mathematics in England

5001
Q15: 2 1 1 2 2 3 31
Q16: 4 2 4 1 3 1 2 2 2 1 1
Q17: 4 2 4 3 2 2 1 1 3
Q18: 1 3 1 2 3 2 4 3 4 4 1 1 2 1 1 2 1 2 3 2 1 4 2
Q19: 2 4 1 4 4 2 2 2 4 2 3 4 4 4
Q20: 5 2 1 2 2 2 2 2 2 2 2 2 3 3 3 3 3 3 2 5
2 5 5 4 5 2 3 3 5 5 1 3 4 4 3 2 5 2 2 4
Q21: 1 0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 1 0 0 0 1 0 1 1 1 1 1 0 0
0 1 1 0 1 1 0 0 0 1 0 0 0 1 1 1 1 1 0 0 0 1 1 1 0 0 1 1
Q22: 2 2 2 2 2 5 2 2 2 2 2 2 2 2 3 2 4 4 4 2 2 4

5002
Q15: 2 2 1 1 2 3 21
Q16: 4 5 4 4 4 2 5 5 5 1 2
Q17: 4 4 4 3 2 2 2 4 4
Q18: 1 4 5 4 2 2 4 2 4 4 2 4 4 3 3 4 2 4 2 4 2 4 2
Q19: 2 4 3 4 4 2 2 2 3 2 4 2 3 4
Q20: 5 5 4 3 5 2 2 3 3 2 4 4 4 3 3 5 4 2 5 3
3 4 4 4 4 5 4 4 4 5 4 4 5 6 [illegible] 3 6 3 3 3
Q21: 0 0 1 1 0 0 0 1 0 1 0 0 0 0 1 0 1 0 1 1 1 1 0 1 1 0 0 0 0
0 0 0 1 1 1 1 0 1 1 0 1 0 1 1 1 1 0 0 0 0 0 0 1 0 0 1 1
Q22: 3 4 2 3 3 5 3 4 4 2 3 4 2 2 4 3 3 2 3 2 2 4

5003
Q15: 1 1 1 1 3 4 47
Q16: 4 4 4 4 4 2 3 4 4 1 2
Q17: 4 2 5 2 2 2 2 2 4
Q18: 2 4 2 4 3 2 4 2 4 4 2 3 4 2 4 2 2 2 2 2 2 4 2
Q19: 2 4 4 4 4 2 2 2 2 2 2 2 4 4
Q20: 2 1 4 1 1 2 2 2 2 2 2 4 4 6 6 5 5 2 3 5
2 5 5 4 5 4 5 4 4 6 2 5 2 6 2 2 5 2 2 5
Q21: 1 1 1 0 0 0 0 0 0 1 1 0 1 0 0 1 1 0 1 0 1 0 1 1 1 1 0 0 1
0 0 0 1 0 1 1 1 0 1 0 0 0 1 1 1 1 1 0 0 1 0 1 1 1 1 1 1
Q22: 3 2 1 1 2 5 2 4 2 2 2 2 2 2 2 3 3 2 2 2 3 2

5005
Q15: 2 1 1 1 2 1 24
Q16: 3 2 3 3 3 3 4 4 3 2 2
Q17: 2 2 4 3 2 4 3 2 4
Q18: 1 3 3 3 4 4 3 3 3 4 2 2 4 3 3 2 1 3 2 4 3 4 4
Q19: 2 2 4 4 4 3 2 3 4 2 3 3 4 4
Q20: 3 3 4 3 4 3 4 5 5 2 6 5 6 4 6 5 3 3 4 5
3 3 4 4 3 3 3 4 4 4 3 3 4 3 3 5 5 4 4 4
Q21: 1 1 1 1 0 0 0 1 0 1 0 1 1 1 0 1 1 0 1 1 1 1 1 1 1 1 1 0 0
0 0 0 1 0 1 0 0 1 1 0 1 0 1 1 0 1 1 1 1 1 0 0 1 1 0 1 1
Q22: 2 5 3 4 4 3 2 2 4 2 2 4 2 3 3 3 4 2 2 3 2 3

5006
Q15: 1 1 2 3 3 5 36
Q16: 4 2 4 4 3 3 5 4 3 1 2
Q17: 1 3 2 1 2 1 3 3 5
Q18: 4 4 2 2 3 2 3 4 4 1 3 3 3 3 4 2 4 3 2 5 1 5 3
Q19: 5 5 5 5 5 2 2 1 3 2 2 3 5 5
Q20: 3 2 2 3 3 3 2 5 5 5 5 3 5 5 5 6 5 5 5 5
5 5 2 5 5 3 6 6 5 5 5 5 2 2 1 5 6 6 5 5
Q21: 1 1 1 1 0 1 1 1 0 1 1 0 0 1 1 1 1 0 0 0 1 1 1 1 0 1 1 1 0
0 1 1 1 0 1 1 1 1 0 1 0 0 1 1 1 1 1 0 0 1 1 1 1 0 1 1 1
Q22: 4 4 4 2 3 3 2 2 4 4 4 3 4 3 4 2 3 4 4 4 4 4

5011
Q15: 1 1 2 1 2 4 25
Q16: 4 4 4 4 2 3 4 4 4 1 2
Q17: 4 5 4 3 2 2 2 4 4
Q18: 3 4 2 2 4 2 3 2 3 4 4 2 4 2 3 1 1 2 2 3 2 2 3
Q19: 4 5 4 5 4 2 2 2 2 2 4 4 5 5
Q20: 2 3 1 2 1 2 3 4 2 2 3 4 3 4 4 4 2 1 3 2
2 1 3 4 3 2 5 4 3 5 3 3 2 5 2 5 5 2 3 2
Q21: 0 1 1 1 0 1 1 0 1 1 0 1 0 0 0 1 1 0 0 0 1 1 1 0 1 1 0 0 0
1 1 0 0 0 1 0 1 1 0 1 0 0 1 1 1 1 1 0 1 1 0 1 1 0 1 0 1
Q22: 4 1 2 3 2 1 3 4 2 3 4 3 4 2 4 2 4 2 4 2 2 2

5013
Q15: 1 1 2 2 2 2 30
Q16: 2 2 5 4 2 4 5 4 3 1 2
Q17: 4 2 5 2 2 2 2 2 4
Q18: 2 2 2 3 4 2 5 3 4 4 2 2 3 3 2 2 1 2 2 4 2 4 2
Q19: 4 3 4 4 4 2 2 2 5 4 5 5 3 5
Q20: 6 5 4 2 1 5 6 5 3 5 5 4 5 5 6 5 3 5 4 6
5 5 2 5 5 5 5 3 3 5 3 5 5 2 2 4 5 5 4 5
Q21: 1 0 1 1 0 1 0 1 0 1 1 0 1 0 1 0 1 1 0 0 1 1 0 1 1 1 1 0 0
1 0 1 1 0 1 1 1 1 1 1 1 1 1 1 0 0 1 0 0 0 0 1 1 1 0 0 0
Q22: 2 4 2 4 2 5 2 2 2 2 3 4 1 2 2 2 2 4 3 1 2 4

5014
Q15: 1 2 1 3 2 3 35
Q16: 4 4 4 2 4 1 4 5 5 1 2
Q17: 4 4 2 1 3 2 4 4 5
Q18: 1 4 4 2 4 1 5 3 4 2 2 2 3 1 2 1 1 4 4 4 2 5 2
Q19: 2 4 4 5 4 2 2 4 4 2 5 3 5 4
Q20: 2 6 6 5 1 5 5 6 3 2 5 5 5 6 6 4 2 1 4 5
6 6 5 5 5 5 6 4 5 6 6 6 5 5 2 3 6 6 3 5
Q21: 1 1 0 0 1 1 1 0 0 1 0 0 1 0 0 0 0 0 0 1 0 0 0 1 1 1 0 0 1
0 1 0 1 0 1 1 0 1 1 1 0 0 1 1 0 1 1 0 1 0 1 0 1 0 1 1 1
Q22: 3 4 4 4 3 1 2 4 5 4 4 3 4 4 5 2 5 4 5 2 5 5

5015
Q15: 1 1 2 3 1 3 36
Q16: 2 4 4 2 4 2 4 4 4 1 2
Q17: 3 2 4 2 2 2 3 4 2
Q18: 2 4 2 3 3 2 3 3 4 3 2 2 3 3 2 2 1 2 3 4 2 4 3
Q19: 2 3 3 2 3 2 2 2 4 3 4 4 3 4
Q20: 5 4 4 2 6 6 6 5 2 3 3 3 3 4 6 1 2 2 3 2
4 4 4 3 3 3 2 3 3 6 5 3 4 2 2 4 4 1 3 4
Q21: 1 1 1 0 1 1 0 0 0 1 1 1 1 1 0 0 1 0 0 0 1 0 0 1 0 0 0 0 0
0 0 1 0 0 1 0 0 0 1 1 1 1 1 1 0 1 1 1 1 2 1 1 1 0 1 1 0
Q22: 4 4 3 2 2 4 4 2 3 4 2 4 4 2 4 2 2 4 4 2 3 4

5018
Q15: 1 1 2 1 1 3 25
Q16: 5 2 4 1 1 1 2 2 3 1 2
Q17: 3 3 4 3 2 2 3 3 3
Q18: 2 3 2 3 3 2 5 3 5 3 3 3 3 3 4 2 3 2 3 3 2 4 3
Q19: 1 1 1 1 1 3 3 5 5 1 5 5 4 2
Q20: 2 6 2 5 6 2 2 3 3 3 3 5 5 6 3 4 2 5 5 5
1 2 5 4 5 3 2 5 2 6 4 4 5 5 3 5 5 6 2 5
Q21: 1 0 1 0 0 0 1 0 1 1 0 0 0 1 0 0 0 0 0 0 0 0 1 1 0 1 0 1
1 0 1 0 1 0 1 0 0 1 0 0 0 0 1 1 1 0 1 1 0 1 0 1 1 0 1 0
Q22: 3 4 3 2 2 4 2 3 4 2 4 4 3 4 4 2 5 2 3 2 4 2

5025

Q15: 1 2 1 3 2 3 50

Q16: 3 3 4 4 2 2 4 3 3 2 3

Q17: 4 4 4 3 2 5 2 2 4

Q18: 2 4 2 3 3 4 4 2 2 4 2 2 3 2 2 2 1 3 2 2 2 2 2

Q19: 3 3 3 4 4 2 2 2 4 2 4 2 4 4

Q20: 4 3 3 4 5 5 4 4 3 4 4 4 4 4 4 4 3 4 5 4

3 1 3 4 4 2 4 4 4 4 3 3 4 3 3 4 3 5 4 3

Q21: 1 0 1 0 0 0 1 1 1 1 1 0 1 0 0 0 0 1 1 1 0 0 1 1 0 1 1 1 0

1 1 1 0 1 1 1 1 1 1 1 0 1 1 1 1 1 1 0 1 0 1 0 1 1 0 1 1

Q22: 4 2 4 4 2 4 2 2 2 3 2 4 4 3 2 2 4 2 2 3 4 2

5026

Q15: 3 1 2 3 3 3 32

Q16: 4 2 5 4 4 4 3 5 3 1 5

Q17: 3 2 4 2 2 2 2 4 5

Q18: 2 5 2 2 2 3 2 3 3 3 2 2 2 3 2 2 1 1 1 4 2 4 2

Q19: 2 2 2 4 4 2 1 1 4 4 4 2 3 4

Q20: 1 2 5 1 1 4 5 5 3 2 3 3 2 4 1 3 1 1 6 1

2 1 3 4 2 2 2 5 6 4 5 3 2 3 2 4 5 6 4 3

Q21: 0 0 1 0 0 0 1 1 0 1 0 0 1 0 1 0 0 0 0 1 0 1 0 1 0 1 0 0 1

1 0 1 1 1 1 1 1 1 1 0 1 0 1 1 0 1 0 0 1 1 1 0 1 0 0 1 1

Q22: 2 2 4 2 2 2 2 2 2 2 2 2 4 2 4 1 4 4 1 2 2 3

5027

Q15: 1 1 2 1 3 3 25

Q16: 4 2 4 4 3 4 2 5 3 1 4

Q17: 3 2 4 2 2 2 3 4 4

Q18: 3 4 4 2 3 1 2 3 3 2 2 4 3 2 3 1 1 4 4 3 2 4 4

Q19: 3 2 2 4 3 2 2 4 4 4 4 3 4 4

Q20: 3 5 2 2 4 5 4 5 3 4 5 5 5 5 4 5 3 4 5 5

4 5 5 5 6 5 5 4 5 4 3 3 4 5 5 4 3 5 4 4

Q21: 1 1 0 1 0 0 0 1 0 1 1 0 1 1 1 1 0 1 1 1 1 1 1 1 0 1 0 0 1

1 1 1 1 0 1 0 1 1 1 1 1 0 1 1 1 1 1 0 0 1 1 1 0 1 1 0 1

Q22: 3 2 3 4 4 4 2 4 4 2 4 3 2 2 2 4 4 4 4 2 3 4

5028

Q15: 2 1 1 2 2 1 28

Q16: 4 2 4 5 4 2 4 4 2 1 1

Q17: 4 4 4 2 2 3 2 4 4

Q18: 2 5 2 4 3 3 4 4 2 4 2 2 3 2 2 2 1 4 3 4 2 5 2

Q19: 2 5 4 4 4 2 2 2 2 2 3 2 5 5

Q20: 5 2 2 2 5 4 2 1 2 2 3 4 5 2 6 3 1 1 2 3

2 5 5 5 5 3 3 5 6 5 1 3 5 2 3 4 6 4 2 3

Q21: 0 0 0 1 0 0 0 0 0 1 0 1 1 0 1 0 0 0 1 0 0 1 0 1 1 0 1 0 0

1 0 0 1 0 1 1 0 1 1 1 1 1 1 1 1 0 1 1 0 0 0 1 1 1 1 1

Q22: 5 4 4 4 2 5 4 3 4 3 3 4 4 2 4 1 3 2 2 2 2 2

5029

Q15: 1 1 1 3 2 3 33

Q16: 4 3 4 4 4 3 4 4 3 1 2

Q17: 4 2 4 5 4 3 3 3 4

Q18: 2 3 2 2 3 3 3 4 4 3 2 4 2 2 2 2 2 2 3 2 2 4 2

Q19: 4 4 4 4 5 2 2 2 2 2 4 4 4 4

Q20: 1 4 3 2 1 5 2 6 2 2 6 5 5 2 3 5 2 3 6 1

1 1 5 5 1 6 6 5 3 2 5 5 5 5 3 5 5 3 2 2

Q21: 1 1 1 1 0 1 1 1 1 1 1 0 1 1 0 1 1 0 1 1 1 1 1 1 1 1 0 1 0

1 1 0 1 0 1 0 0 1 1 1 1 1 1 1 1 1 0 0 1 0 1 1 0 1 1 1

Q22: 3 2 2 2 2 1 2 2 4 2 2 3 2 2 2 4 2 4 2 2 4 4

5030

~~Q15: 1 1 2 1 2 1 25~~

Q16: 2 4 4 4 4 2 2 4 2 1 2

~~Q17: 1 1 5 3 2 4 1 1 4~~

Q18: 2 4 2 4 5 2 4 2 3 5 2 2 2 4 1 1 2 2 2 1 4 4 4

~~Q19: 1 4 1 5 5 2 5 1 1 1 5 1 3 5~~

Q20: 5 2 2 2 2 2 5 5 2 2 5 6 6 5 5 6 2 2 6 6

~~5 5 5 6 6 6 6 6 2 5 1 1 5 2 2 1 2 6 3 1~~

Q21: 0 1 0 1 1 0 1 1 0 1 0 0 1 0 0 0 0 0 0 0 1 1 1 0 1 0 1 0 0

~~1 0 0 1 0 1 1 0 1 0 1 1 1 1 1 1 1 1 0 0 0 1 1 1 1 1 1 1~~

Q22: 4 2 4 4 2 5 2 2 4 4 1 2 2 1 4 5 2 2 4 1 2 5

5032

~~Q15: 1 1 2 1 2 3 29~~

Q16: 2 2 1 4 2 4 3 5 3 1 1

~~Q17: 3 3 4 5 4 1 2 1 4~~

Q18: 1 5 2 2 2 2 4 2 4 4 2 2 3 2 3 2 1 1 3 4 3 5 4

~~Q19: 2 2 2 2 2 3 2 2 2 3 3 3 3 4~~

Q20: 3 3 5 2 2 5 2 5 5 5 4 5 5 4 3 3 2 1 5 3

~~1 2 4 5 2 2 3 5 4 4 3 3 5 5 2 3 5 4 4 5~~

Q21: 1 1 0 0 0 0 0 0 1 1 0 0 0 0 1 1 0 0 0 0 1 0 0 1 0 0 1 0 1

~~0 0 0 0 0 1 1 1 1 0 1 0 0 1 1 1 1 1 0 1 1 1 0 0 1 0 1 1~~

Q22: 2 4 2 3 4 3 4 2 4 2 3 2 3 2 2 3 4 2 4 2 4 4

5033

~~Q15: 2 1 1 1 2 3 23~~

Q16: 4 4 4 3 3 1 4 3 3 1 2

~~Q17: 3 1 4 4 3 2 1 1 4~~

Q18: 3 3 3 4 3 3 4 3 3 4 1 2 4 3 2 4 2 2 3 2 3 4 4

~~Q19: 2 2 2 3 2 2 2 3 4 3 4 4 4 3~~

Q20: 5 5 5 2 3 3 5 4 5 2 5 4 5 5 5 4 4 3 5 5

~~2 2 2 4 4 5 5 3 3 5 5 5 3 3 4 4 5 2 4 4~~

Q21: 1 1 0 1 0 0 1 1 1 1 1 1 0 1 1 1 0 1 1 .0 1 1 1 1 0 1 0 1 1

~~0 1 1 1 0 1 1 1 1 0 1 1 0 1 1 1 0 1 1 0 1 1 1 1 0 1 1 1~~

Q22: 3 2 2 4 3 5 4 4 3 3 4 3 5 4 3 2 4 2 4 4 4 4

5034

~~Q15: 2 2 1 2 2 4 33~~

Q16: 4 2 1 2 4 1 3 5 4 1 1

~~Q17: 2 2 5 3 2 2 1 4 5~~

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5104

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5105

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5106

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5108

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5109

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5110

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Q21: 0 1 0 0 0 0 1 1 0 1 1 0 1 0 1 0 0 0 0 0 0 0 1 1 0 1 0 0 1

Q22: 2 4 2 2 3 4 3 3 4 2 4 3 3 3 2 2 4 2 2 2 2 4

5116

Q15: 2 2 1 2 2 3 27
Q16: 4 4 4 4 5 4 4 5 4 1 1
Q17: 3 3 4 2 2 2 2 2 5
Q18: 1 5 1 2 2 3 5 3 5 4 2 1 1 2 2 1 1 4 1 2 2 4 5
Q19: 1 1 1 1 1 1 1 5 5 5 5 5 4 5
Q20: 5 5 3 6 1 1 2 5 5 5 5 4 5 1 6 2 2 5 6 6
2 6 6 4 6 5 4 6 1 3 2 2 6 2 2 6 6 1 6 6
Q21: 1 1 1 1 0 0 0 1 0 1 0 0 1 0 0 1 1 1 1 0 1 1 1 1 0 0 1 1 0
1 1 1 1 0 1 0 0 0 1 1 1 0 1 1 1 0 1 0 0 0 1 1 1 1 1 1 1
Q22: 5 4 5 5 1 5 2 1 1 5 5 5 4 2 2 5 5 5 1 4 2 3

5117

Q15: 1 1 1 1 2 3 26
Q16: 3 3 4 2 4 3 3 3 3 2 3
Q17: 2 2 2 2 2 4 2 2 5
Q18: 2 4 2 2 2 2 2 3 3 2 3 2 3 2 3 1 1 1 3 2 2 4 3
Q19: 2 4 2 3 4 2 2 2 4 2 4 2 3 4
Q20: 5 2 2 1 2 5 4 4 4 1 5 4 5 4 3 4 3 2 3 4
4 4 5 3 5 5 2 5 2 2 2 3 2 2 2 3 3 4 4 3
Q21: 0 0 1 1 0 1 1 1 1 1 0 0 0 0 1 1 1 0 0 1 0 1 1 1 0 1 0 0 0
1 0 1 1 1 1 1 0 1 1 0 0 1 0 1 0 1 1 0 1 0 1 1 1 1 0 1 0
Q22: 4 2 4 2 4 5 2 3 4 2 3 4 4 2 4 2 3 2 2 2 2 2

5118

Q15: 1 2 1 1 2 3 23
Q16: 4 4 5 4 5 4 3 2 4 2 3
Q17: 2 2 4 3 2 4 4 2 4
Q18: 2 4 2 2 2 2 4 3 4 2 2 3 4 3 2 2 1 4 3 4 4 4 3
Q19: 1 2 2 4 3 1 1 5 5 4 5 4 2 3
Q20: 3 2 3 1 1 2 3 1 5 1 4 4 4 3 2 3 2 1 6 3
2 1 2 2 1 5 4 4 5 2 6 3 4 4 4 5 6 6 5 3
Q21: 1 0 1 1 0 1 0 1 1 1 1 0 1 0 1 1 0 0 1 0 0 1 0 1 0 1 0 0 0
1 0 1 1 0 1 0 1 1 0 1 1 0 1 1 0 0 1 0 1 0 1 0 0 1 1 1 0
Q22: 3 4 3 2 4 4 2 2 4 2 1 2 2 3 2 2 4 3 2 2 3 2

5120

Q15: 1 2 1 1 2 2 22
Q16: 4 2 4 4 4 4 4 4 4 2 2
Q17: 3 2 4 2 4 2 2 2 4
Q18: 2 4 4 2 4 4 4 2 4 4 4 2 4 2 2 2 2 4 4 4 4 4 4
Q19: 2 3 4 4 4 2 2 4 4 4 4 4 4 4
Q20: 5 4 2 5 5 5 5 6 5 5 5 5 5 4 5 5 5 2 3 5
5 5 5 5 5 2 4 5 2 4 4 4 4 5 3 3 5 5 5 5
Q21: 1 0 0 1 1 0 0 0 1 1 1 0 0 1 1 1 0 1 0 0 1 0 1 1 1 1 1 0 0
0 1 1 1 0 1 0 0 1 0 1 1 0 1 1 1 1 1 1 0 1 1 1 1 0 1 1 1
Q22: 4 4 4 4 4 4 4 4 4 4 4 4 4 4 2 2 4 4 4 2 4 4

5121

Q15: 1 1 2 1 1 2 23
Q16: 5 1 5 5 5 2 2 3 1 1 2
Q17: 3 3 4 2 1 2 2 4 5
Q18: 1 4 4 1 1 1 5 3 3 3 2 1 5 1 5 1 2 5 5 5 2 5 1
Q19: 1 4 4 5 5 2 2 1 1 1 2 2 5 5
Q20: 1 6 6 6 6 2 5 6 6 3 6 6 6 6 4 6 2 5 1 4
2 3 6 3 2 5 6 6 3 2 3 6 1 6 4 5 5 3 2 6
Q21: 1 0 1 1 0 0 0 1 1 1 0 0 0 0 0 0 1 0 0 0 0 1 0 1 0 0 1 0 0
1 0 1 1 1 1 1 1 0 0 1 0 0 1 1 1 0 0 0 0 1 0 1 1 0 1 0 1
Q22: 1 5 5 1 5 5 2 5 5 5 5 2 3 5 4 3 5 2 4 5 5 5

5123

Q15: 1 2 1 1 2 3 0

Q16: 4 3 4 4 4 2 2 4 2 1 1

Q17: [illegible] 4 4 5 4 4 3 4 4

Q18: 4 4 3 4 2 2 4 2 4 1 2 2 4 3 3 2 1 1 1 4 4 1 2

Q19: [illegible] 4 4 2 2 2 4 2 5 5 5 5

Q20: 5 2 2 4 2 2 5 5 3 1 4 5 5 4 6 4 3 3 4 4

2 5 2 5 2 1 2 5 4 4 3 2 5 2 [illegible] 5 5 5 5 4

Q21: 1 1 0 1 1 1 1 0 1 1 0 0 0 1 1 1 1 1 1 0 1 1 1 1 1 1 0 0 0

1 1 0 1 [illegible] 1 0 0 1 1 1 1 1 1 1 1 [illegible] 1 1 0 1 0 1 1 0 1 1 1

Q22: 2 1 2 2 4 5 4 4 2 4 2 4 4 4 5 2 4 2 3 2 4 3

5125

Q15: 1 1 2 2 1 3 27

Q16: 2 3 4 3 3 3 4 4 3 1 2

Q17: 3 3 3 3 3 3 3 3 3

Q18: 2 4 3 3 3 3 3 3 3 4 3 3 3 3 4 3 2 3 3 3 3 3 3

Q19: 2 4 5 5 5 3 3 2 2 2 4 3 4 4

Q20: 4 4 4 2 5 4 3 4 3 4 4 3 4 2 5 5 3 3 3 6

[illegible] 6 2 3 4 4 5 4 6 5 5 6 6 6 [illegible] 5 6 6 6 6

Q21: 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 0 1

[illegible]

Q22: 3 3 3 3 3 5 3 3 2 2 2 3 2 2 5 5 5 5 5 5 5 5

APPENDIX N (continued)

Response Frequencies in the ENGLISH SAMPLE for the Background Information Variables and for the KNOWLEDGE of Innovation Variable

			Response Frequencies		
			(a) (n = 97)	(b) (n = 90)	(c) (n = 82)
BACKGROUND INFORMATION VARIABLES	Sex	Male	61	57	54
		Female	36	33	28
	Academic Qualifi-cations	Graduate	51	48	45
		Non-Graduate	46	42	37
	Professional Training	Trained	66	60	54
		Un-trained	31	30	28
	Teaching Experience	Less than five years	55	52	46
		Five to ten years	16	15	15
		More than ten years	26	23	21
	Type of School	State	61	57	54
		Private	36	33	28
KNOWLEDGE OF INNOVATION VARIABLE	Familiarity	Quite Unfamiliar	14	10	10
		Quite Familiar	67	64	57
		Very Familiar	16	16	15

NOTE: (a) No of completed questionnaires:

1. Initially: 101
2. After rejecting those with numerous items omitted: (Column a) 97
3. After rejecting those with Lie scores greater than 5: (Column b) 90
4. After rejecting those with age only omitted: (Column c) 82

(b) All respondents were Attending a COURSE.

Frequency distribution of scores for Dogmatism in the ENGLISH SAMPLE (n = 82)

Scores	Frequency distribution of scores
54-81	2
82-109	4
110-137	28
138-165	29
166-193	15
194-221	4

Frequency distribution of scores for Experience of Bureaucracy in the ENGLISH SAMPLE (n = 82)

Scores	Frequency distribution of scores
15-22	6
23-30	20
31-38	31
39-46	15
47-54	6
55-62	4

Frequency distributions of scores for the composite variables which represented the first-level factors of attitude to Curriculum Innovation for the ENGLISH SAMPLE (n = 82)

(f_1)

Scores	Frequency distribution of scores
10-12	2
13-15	15
16-18	37
19-21	26
22-24	1
25-27	1

(f_2)

Scores	Frequency distribution of scores
11-13	1
14-16	9
17-19	36
20-22	24
23-25	11
26-28	1

(f_3)

Scores	Frequency distribution of scores
11-13	3
14-16	15
17-19	37
20-22	22
23-25	4
26-28	1

(f_4)

Scores	Frequency distribution of scores
5- 6	11
7- 8	21
9-10	27
11-12	20
13-14	3

(f_7)

Scores	Frequency distribution of scores
23-26	1
27-30	29
31-34	30
35-38	18
39-42	4

(f_8)

Scores	Frequency distribution of scores
16-19	5
20-23	24
24-27	29
28-31	19
32-35	4
36-39	1

(f_9)

Scores	Frequency distribution of scores
5- 6	9
7- 8	20
9-10	45
11-12	8

Means and standard deviations of scores for the first-level factors of attitudes to curriculum innovation by sample

	The first-level factors of attitude to curriculum innovation													
	For curriculum innovation in general				For curriculum innovation in specific subjects (i.e. Engineering Drawing and Mathematics)									
	f_1		f_2		f_3		f_4		f_7		f_8		f_9	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
ENGLISH SAMPLE (n = 82)	17.390	2.371	19.463	2.803	18.451	2.763	9.134	2.023	32.170	3.647	25.439	4.061	8.793	1.537
FAMILIAR INDIAN SAMPLE (n = 80)	15.062	3.688	20.887	3.536	24.012	3.668	10.912	2.403	35.287	6.574	31.037	4.928	9.650	2.075
't' between ENGLISH/ INDIAN SAMPLES	4.772 ($P < .001$)		-2.836 ($P < .01$)		-10.882 ($P < .001$)		-4.274 ($P < .001$)		-3.719 ($P < .001$)		-7.881 ($P < .001$)		-2.566 ($P < .01$)	

NOTE

(a) f_5 and f_6 were not included in the Replication Study (see text).

(b) The 't' value for a one-tailed test was 3.090 (df = ∞) at the 0.1 per cent level of significance and 2.326 at the 1 per cent level.

(c) For f_1, f_3, f_7 and f_9, the variances in the two samples were not homogeneous and the Welch test was used (see below).

APPENDIX N (continued)

The Welch Test (Brownlee, 1960)

To test the null hypothesis that $M_1 = M_2$ when the variances of the distributions were not assumed to be equal, the modified formula for calculating the value of 't' was:

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (M_1 - M_2)}{\sqrt{\dfrac{s_1^2}{n_1} + \dfrac{s_2^2}{n_2}}} \quad \text{for df:} \; \frac{\left[\left(\dfrac{s_1^2}{n_1}\right) + \left(\dfrac{s_2^2}{n_2}\right)\right]^2}{\dfrac{\left(\dfrac{s_1^2}{n_1}\right)^2}{n_1-1} + \dfrac{\left(\dfrac{s_2^2}{n_2}\right)^2}{n_2-1}}$$

where: $\bar{x}_1$, $\bar{x}_2$ = sample means

M_1, M_2 = population means

s_1^2, s_2^2 = sample variances

The simple correlations between the composite variables representing the first-level factors of attitude to curriculum innovation and the independent variables in the ENGLISH SAMPLE (n = 82)

		Simple Correlations between first-level factors and independent variables				
		Type of School (State/ Private)	Teaching Experience (LESS THAN/ MORE THAN 10 years)	Professional Training (Trained/ Untrained)	Experience of Bureaucracy	Dogmatism
The composite variables representing the first-level factors of attitude to curriculum innovation	f_1	-.053 (.053)	.061 (.212)	.109 (.137)	-.285 ** (-.210)	-.196 (-.387)**
	f_2	.005 (.114)	.044 (.111)	.008 (-.036)	.029 (.067)	.247 * (.079)
	f_3	.145 (.129)	.020 (.042)	-.054 (-.017	.135 (.136)	.091 (-.155)
	f_4	.092 (-.094)	.173 (-.061)	-.006 (.087)	-.114 (-.061)	-.143 (-.212)
	f_7	.037 (.309)**	.151 (.010)	-.024 (.009)	-.149 (-.065)	-.183 (-.071)
	f_8	.237 * (.110)	.101 (.035)	-.002 (.003)	-.123 (-.181)	-.243 * (-.407)**
	f_9	.169 (.010)	.183 (.046)	-.027 (.073)	-.012 (.087)	.260 * (.268)*

* significant at the five per cent level
** significant at the one per cent level

($P_{.05}$ = .217 for df = 80; $P_{.01}$ = .283 for df = 80)

NOTE: (a) The correlations given in brackets were those obtained in the MAIN FAMILIAR SAMPLE (n = 80) in India.

(b) For the categorical variables the scoring was 1 for the first alternative and 2 for the second alternative.

(c) The correlation for the artificial dichotomy TEACHING EXPERIENCE was that obtained after correction.

(d) Only the correlations for the independent variables that were common to the original study in India and to the replication study were given here.

APPENDIX N (continued)

Matrix of the Product-Moment Inter-Correlations of the Composite Variables Representing the First-Level Factors of Attitude to Curriculum Innovation in the ENGLISH SAMPLE (n=90)

	The Composite Variables Representing the First-Level Factors						
	f_1	f_2	f_3	f_4	f_7	f_8	f_9
f_1	-						
f_2	-.020 (.010)	-					
f_3	-.092 (-.029)	.046 (-.117)	-				
f_4	.111 (.008)	-.107 (-.280*)	.420** (.108)	-			
f_7	.067 (.146)	-.081 (.001)	.625** (.168)	.429** (.262)*	-		
f_8	.142 (.064	-.085 (-.157)	.451** (.235)*	.489** (.482)**	.494** (.439)**	-	
f_9	-.111 (-.197)	.103 (-.055)	.139 (.134)	.037 (-.029)	.159 (.184)	-.028 (.077)	-

* Significant at the five per cent level

** Significant at the one per cent level

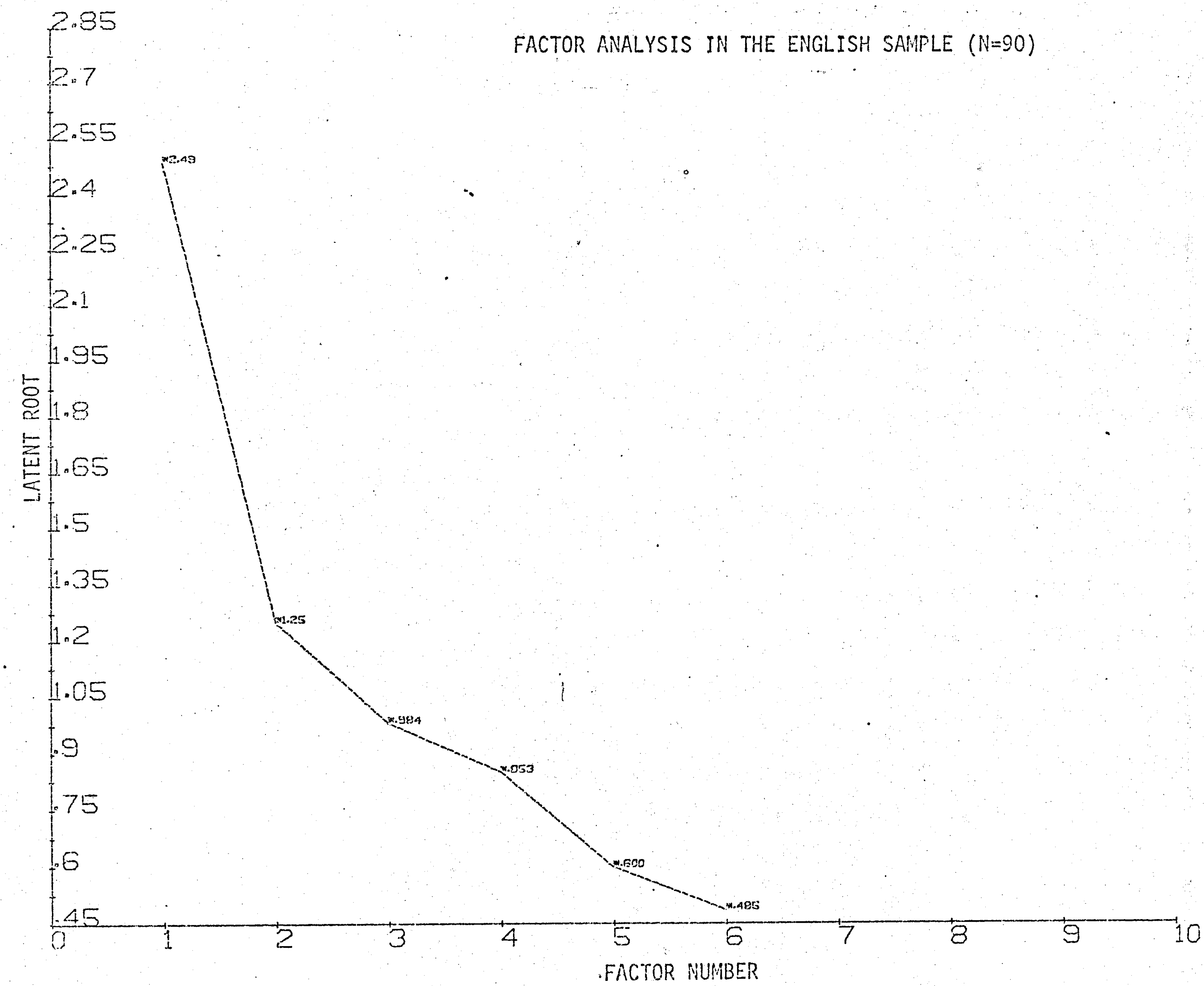
(NOTE: The correlations obtained in the INDIAN MAIN FAMILIAR SAMPLE (n=80) were those in brackets)

Second-level factor matrix for the composite variables representing the first-level factors of attitude to Curriculum Innovation (from the Principal Components Analysis of the inter-correlations of the composite variables in the ENGLISH SAMPLE (n = 90))

The composite variables representing the First-level factors	COMMON FACTOR LOADINGS (Unrotated)		h^2 %
	I	II	
f_1	-.106	.613	.39
f_2	.108	-.493	.25
f_3	-.792	-.278	.70
f_4	-.734	.165	.56
f_7	-.827	-.098	.69
f_8	-.769	.216	.64
f_9	-.151	-.688	.49
Latent Roots	2.488	1.252	
% Common Variance	35.5	17.9	

GRAPH OF LATENT ROOTS AGAINST FACTOR NUMBERS FOR THE SECOND-LEVEL

FACTOR ANALYSIS IN THE ENGLISH SAMPLE (N=90)



The Coefficients of congruence between the Second-level factors extracted from the teachers' responses in the ENGLISH SAMPLE and those extracted from the teachers' responses in the MAIN FAMILIAR SAMPLE (in India)

(i) ϕ for F_A (in India) and EF_A (in England)

Composite variables representing the First-level factors	Second-level Factor loadings				
	$1ajp(F_A)$	$2ajq(EF_A)$	$\sum 1ajp.2ajq$	$\sum 1ajp^2$	$\sum 2ajq^2$
f_1	-.169	-.088	.015	.032	.008
f_2	.375	.093	.035	.141	.009
f_3	.412	-.799	.329	.169	.638
f_4	-.724	-.729	.528	.524	.531
f_7	-.668	-.829	.554	.446	.687
f_8	-.820	-.763	.626	.672	.582
f_9	-.146	-.171	.025	.021	.029
			2.112	2.005	2.484

$$\phi = \frac{\Sigma 1ajp.2ajq}{\sqrt{(\Sigma 1ajp^2)\ (\Sigma 2ajq^2)}} = \frac{2.112}{\sqrt{(2.005)\ (2.484)}} = \frac{2.112}{2.2317} = \underline{\underline{.946}}$$

(ii) ϕ for F_B (in India) and EF_B (in England)

Composite variables representing the First-level factors	Second-level Factor loadings				
	$1ajp(F_B)$	$2ajq(EF_B)$	$\sum 1ajp.2ajq$	$\sum 1ajp^2$	$\sum 2ajq^2$
f_1	.721	.616	.444	.520	.379
f_2	.108	-.495	-.053	.012	.245
f_3	-.351	-.255	.089	.123	.065
f_4	.109	.186	.020	.012	.034
f_7	-.005	-.074	.000	.000	.057
f_8	.021	.238	.005	.000	.057
f_9	-.759	-.683	.518	.576	.466
			1.023	1.243	1.251

$$\phi = \frac{1.023}{\sqrt{(1.243)\ (1.251)}} = \frac{1.023}{1.2469} = .820$$

Frequency distributions of EF'_A and EF'_B scores for the ENGLISH SAMPLE (n = 82)

EF'_A Scores	Frequency distribution of scores
-4.5 to -3.1	5
-3.0 to -1.6	9
-1.5 to 0	26
0 to 1.5	26
1.6 to 3.0	12
3.1 to 4.5	4

EF'_B Scores	Frequency distribution of scores
-3 to -2.1	2
-2 to -1.1	7
-1 to 0	30
0 to 1	27
1.1 to 2	13
2.1 to 3	3

Matrix of the product-moment intercorrelations of dependent and independent variables in the ENGLISH SAMPLE (n = 82)

	Background Information Variables and Knowledge of Curriculum Innovation Variables							Organisation variable	Personality variable	Second-level factors of attitude to curriculum innovation	
								Experience of Bureaucracy	Dogmatism		
	(Sex) Q15.1	(Acad. Qual.) Q15.2	(Prof. Training) Q15.3	(Teach. Exp.) Q15.4	Familiarity Q15.5	(Type of School) Q15.6	(Age) Q15.7	Q.19	Q.20	EF'_A	EF'_B
Q15.1	-										
Q15.2	.109	-									
Q15.3	-.214	-.491	-								
Q15.4	-.186	.046	.140	-							
Q15.5	.171	.005	-.134	-.051	-						
Q15.6	-.007	.022	.088	.073	.179	-					
Q15.7	-.037	.104	.029	.691	-.195	.184	-				
Q19	.015	.318	-.058	-.217	-.163	-.200	-.132	-			
Q20	-.079	.060	.042	.030	-.127	.081	.111	.304	-		
EF'_A	.154	-.030	.012	-.123	-.041	-.156	.012	.154	.231	-	
EF'_B	-.011	.028	.083	-.045	.129	-.158	-.221	-.184	-.322	.068	-

NOTE: See text for the dichotomisation of the categorical variables, the scoring procedures and the corrections made (where necessary) to these correlation coefficients.

APPENDIX N (continued)

DATA FOR THE MULTIPLE CORRELATION ANALYSES

	Q15							Q 19	Q20	Q21 N	Q21 E	Q21 L	Q 22	RF_1	RF_2	EF'_A	EF'_B
	1	2	3	4	5	6	7										
5003	1	1	1	1	2	2	47	30	160	8	6	2	81	-0.508	-1.269	0.725	-0.344
5006	1	1	2	2	2	2	36	22	121	2	8	0	57	1.156	-0.633	-2.837	0.441
5011	1	1	2	1	2	2	25	28	195	5	7	3	72	-0.746	-0.995	-0.159	-1.428
5013	1	1	2	1	2	1	30	39	120	13	7	3	75	0.080	-0.849	1.914	-0.642
5014	1	2	1	2	2	1	35	36	112	12	9	0	50	0.942	-0.093	-2.615	-0.451
5015	1	1	2	2	1	1	36	43	166	14	8	4	63	-0.426	-0.449	0.242	-1.046
5018	1	1	2	1	1	1	25	58	132	21	9	4	64	-0.320	-0.077	0.343	-0.748
5025	1	2	1	2	2	1	58	34	138	9	8	4	69	0.115	-0.635	1.361	-1.917
5026	1	1	2	2	2	1	32	37	184	16	12	2	79	-1.530	0.293	-0.394	0.548
5027	1	1	2	1	2	1	25	42	115	3	14	5	62	0.851	0.687	-3.390	0.930
5029	1	1	1	2	2	1	33	32	160	0	4	2	77	0.116	-1.849	-0.323	-0.047
5030	1	1	2	1	2	1	25	29	147	9	8	5	68	-0.017	-0.623	3.457	1.015
5032	1	1	2	1	2	1	29	43	147	12	12	2	67	-0.293	0.364	0.943	0.122
5036	1	1	1	1	1	1	46	51	211	17	10	4	93	-2.412	-0.322	1.262	-2.619
5039	1	2	2	2	1	1	61	44	184	5	5	5	84	-0.829	-1.604	2.070	1.717
5040	1	2	1	2	2	1	34	32	127	6	10	3	70	0.377	-0.259	-3.784	-0.259
5041	1	2	1	1	2	1	26	34	172	9	13	0	65	-0.556	0.548	0.238	0.909
5042	1	1	1	1	2	1	29	37	155	19	15	1	62	-0.778	1.264	2.141	-2.236
5043	1	1	2	1	2	1	24	29	174	11	9	3	55	-0.266	-0.186	4.555	0.633
5044	1	2	1	2	2	1	41	47	145	8	7	2	73	-0.038	-0.937	0.292	-0.642
5045	1	1	2	2	2	1	34	25	136	2	11	4	59	0.721	0.020	0.159	1.228
5046	1	1	1	1	2	1	30	25	146	6	14	1	63	0.099	0.737	-1.278	0.633
5048	1	1	2	2	2	1	33	37	188	15	12	4	60	-0.990	0.517	-0.712	-0.642
5049	1	1	1	1	2	1	27	35	139	2	14	3	68	0.297	0.585	-2.455	0.824
5064	1	1	1	1	2	1	24	28	150	4	16	2	77	-0.344	0.966	-1.802	-0.536
5065	1	1	1	1	2	1	26	31	133	16	11	1	61	-0.047	0.305	-0.586	-0.642
5066	1	1	1	1	2	1	26	24	111	7	13	4	62	0.740	0.549	-1.639	0.633
5067	1	1	1	2	2	1	44	30	113	5	8	3	65	0.902	-0.669	3.478	0.335
5070	1	1	2	1	2	1	26	39	156	7	11	1	58	0.117	0.142	-0.306	1.121
5075	1	1	1	1	2	1	26	36	113	7	7	0	60	0.974	-0.787	-0.260	1.610
5077	1	1	2	1	2	1	26	47	140	12	14	3	72	-0.384	0.754	1.517	-0.642
5085	1	1	1	1	1	1	26	24	143	10	17	0	58	-0.023	1.572	1.546	0.441
5087	1	2	1	1	2	1	28	34	141	15	9	2	68	-0.272	-0.262	1.193	1.908
5076	1	1	2	1	2	1	24	47	124	8	19	3	69	0.034	1.842	-1.442	-0.047
5078	1	2	1	1	2	1	24	32	121	9	16	2	52	0.638	1.403	-2.091	-0.153
5081	1	2	1	1	1	1	36	39	132	6	14	2	70	0.146	0.648	-0.499	-1.535
5088	1	2	1	1	2	2	30	36	147	15	10	2	76	-0.650	-0.139	-0.310	-1.726
5089	1	1	2	2	1	1	46	28	139	13	5	5	75	-0.191	-1.306	-1.525	0.335
5090	1	2	1	2	2	1	33	32	84	10	13	0	42	1.650	0.877	0.356	1.610
5097	1	2	1	1	2	1	22	36	183	12	13	3	59	-0.742	0.691	1.013	0.441
5102	1	1	2	1	2	2	29	15	128	9	10	2	64	0.371	-0.115	-2.510	0.739
5103	1	1	2	2	2	2	60	33	133	12	9	3	60	0.270	-0.224	-2.213	-0.153
5104	1	2	1	2	2	2	42	15	110	11	9	5	59	0.769	-0.231	-0.804	1.717
5105	1	1	1	1	2	1	28	29	173	10	4	4	65	-0.311	-1.473	1.324	-0.047
5106	1	2	1	2	2	1	33	32	199	21	7	2	73	-1.721	-0.654	1.809	0.250
5108	1	2	1	1	1	1	22	56	175	17	13	2	54	-0.724	0.867	-1.299	0.739
5109	1	2	1	1	2	1	24	53	154	15	12	2	60	-0.377	0.520	0.632	-1.046
5110	1	2	1	1	1	1	27	32	150	11	9	1	56	0.136	-0.196	1.440	-0.451

5112	1	1	1	1	2	2	25	28	110	3	6	2	56	1.400	-1.051	-1.086	-0.748
5117	1	1	1	1	2	1	26	37	169	13	9	3	68	-0.667	-0.309	-0.494	-0.451
5118	1	2	1	1	2	1	23	50	168	11	11	3	74	-0.787	0.022	-1.307	1.717
5120	1	2	1	1	2	1	22	40	111	4	13	3	50	1.256	0.638	0.293	2.206
5121	1	1	2	1	1	1	23	21	119	13	9	1	45	0.908	-0.006	-4.273	1.738
5125	1	1	2	1	1	1	27	32	113	11	14	3	53	0.714	0.981	-0.188	-0.748
5001	2	1	1	1	2	1	31	38	188	14	6	2	76	-1.193	-1.074	2.854	-1.428
5002	2	2	1	1	2	1	21	35	145	15	8	1	65	-0.221	-0.451	-0.754	-0.642
5005	2	1	1	1	2	1	24	36	138	9	2	5	68	0.356	-1.985	0.569	0.526
5033	2	1	1	1	2	1	23	46	130	0	14	4	56	0.921	0.697	1.919	0.526
5034	2	2	1	1	2	2	33	32	191	8	11	3	75	-1.067	-0.059	0.045	-1.237
5055	2	2	1	1	2	1	46	36	108	5	14	4	66	0.751	0.680	1.156	0.250
5057	2	1	2	2	2	2	42	27	128	3	10	4	63	0.729	-0.235	-0.770	-0.451
5059	2	1	2	1	2	1	23	32	162	12	14	1	81	-1.044	0.635	3.457	1.228
5052	2	1	1	1	2	1	28	21	90	5	8	3	42	1.991	-0.369	-1.512	2.206
5053	2	2	1	1	2	2	28	58	163	23	3	2	79	-1.217	-1.593	-0.095	-0.153
5054	2	2	1	1	2	2	28	43	200	10	11	2	74	-1.309	-0.002	2.275	-0.642
5060	2	1	2	1	2	1	27	36	134	14	7	0	69	-0.050	-0.751	2.309	0.624
5061	2	1	2	1	2	1	32	30	155	16	11	3	67	-0.620	0.225	-0.076	0.144
5063	2	2	1	1	2	1	29	40	149	12	5	3	67	-0.082	-1.225	-4.337	-0.344
5068	2	1	1	1	2	1	23	36	144	10	9	2	75	-0.258	-0.464	-3.616	0.037
5071	2	1	1	1	2	1	25	23	54	4	12	1	41	2.583	0.533	-0.204	1.334
5072	2	2	1	1	2	1	33	30	78	5	11	1	52	1.808	0.183	1.206	-0.642
5082	2	1	2	1	2	1	22	27	127	12	16	0	55	0.278	1.430	2.077	-0.833
5084	2	1	1	1	2	1	22	28	140	14	10	3	76	-0.469	-0.161	0.263	0.930
5099	2	1	1	2	1	1	49	26	135	7	4	4	57	0.772	-1.432	2.288	-1.237
5079	2	1	1	2	2	1	50	19	150	7	8	5	70	-0.020	-0.693	-0.381	0.250
5095	2	2	1	1	2	1	31	35	138	13	9	4	77	-0.373	-0.423	1.529	2.206
5096	2	2	1	2	2	1	57	33	184	22	12	2	74	-1.711	0.491	-2.787	-1.726
5098	2	2	1	1	1	1	37	46	173	18	18	1	59	-1.066	1.961	1.538	0.250
5111	2	2	1	1	2	1	24	40	136	2	18	2	59	0.474	1.610	0.922	-0.259
5114	2	2	1	1	2	1	23	40	98	12	15	4	65	0.543	1.076	-0.909	0.144
5115	2	1	1	1	2	1	22	38	145	10	15	4	70	-0.341	0.962	1.977	-1.046
5116	2	2	1	1	2	1	27	55	133	7	6	4	55	0.796	-0.052	1.596	1.419

Summary of the Stepwise Regression Analyses with the Second-level factors of attitude to curriculum innovation as dependent variables for the Multiple Correlation Analyses IV and V in the ENGLISH SAMPLE

(i) EF'_A as dependent variable

STEP 1

Variable entered: Dogmatism

Analysis of Variance Table

Source	df	Sum of Squares	Variance	F
Regression on all variables	1	15.03692	15.03692	4.53855
Due to residual	80	265.05218	3.31315	
TOTAL	81	280.0891		

Variable	B	S.E of B	B/S.E of B	Partial Correlation
Dogmatism	-0.0146	0.0068	2.1303	-0.2317

Constant = -2.0423

Multiple correlation = .2317

Percentage goodness of fit = 5.3685

No more variables found to be significant. Stepwise Regression procedure completed.

(Significance level to enter variables = 5 per cent)

(Significance level to remove variables = 5 per cent)

(ii) EF'$_B$ as dependent variable

STEP 1

Variable entered : Dogmatism

Analysis of Variance Table

Source	df	Sum of Squares	Variance	F
Regression on all variables	1	9.72578	9.72578	9.27140
Due to residual	80	83.92071	1.04900	
TOTAL	81	93.64649		

Variable	B	S.E of B	B/S.E of B	Partial Correlation
Dogmatism	-0.0117	0.0038	3.0448	-0.3222

Constant = 1.7602

Multiple correlation = .3222

Percentage goodness of fit = 10.3855

No more variables found to be significant. Stepwise Regression procedure completed.

(Significance level to enter variables = 5 per cent)

(Significance level to remove variables = 5 per cent)

APPENDIX N (continued)

Summary of the Stepwise Regression Analysis with the Second-Level Factors of Attitudes to Curriculum Innovation as Dependent Variables for the Multiple Correlation Analyses VI and VII in the ENGLISH SAMPLE (n=82)

Significance level to enter variables = 5 per cent
Significance level to remove variables = 5 per cent

i. EF'_A as Dependent Variable (Multiple Correlation Analysis (VI))

Step 1. Variable entered: RF_1 (the Emotionality-RESISTIVITY FACTOR)

Analysis of Variance Table

Source	df	Sum of Squares	Variance	F
Regression on all Variables	1	16.94330	16.94330	5.15100
Due to Residual	80	263.14581	3.28932	
TOTAL	81	280.08911		

Variable	B	SE of B	B/SE of B	Partial Correlation
RF_1	-0.5224	0.2302	2.2695	-0.2459

Constant = 0.1014

Multiple Correlation = 0.2459

Percentage Goodness of Fit = 6.0491

No more Variables found to be significant.

ii. EF'_B as Dependent Variable (Multiple Correlation Analysis VII)

Step 1. Variable entered: RF_1

Analysis of Variance Table

Source	df	Sum of Squares	Variance	F
Regression on all Variables	1	10.08561	10.08561	9.65582
Due to Residual	80	83.56088	1.04451	
TOTAL	81	93.64649		

Variable	B	SE of B	B/SE of B	Partial Correlation
RF_1	0.4031	0.1297	3.1073	0.3281

Constant = 0.0377
Multiple Correlation = 0.3281
Percentage Goodness of Fit = 10.7698

Step 2. Variable entered: AGE

Analysis of Variance Table

Source	df	Sum of Squares	Variance	F
Due to Regression on age	1	4.85684	4.85684	4.87510
Regression on Previous Variables	1	10.08561		
Regression on all Variables	2	14.94246	7.47123	7.49932
Due to Residuals	79	78.70404	0.99625	
TOTAL	81	93.64649		

Variable	B	SE of B	B/SE of B	Partial Correlation
RF_1	0.4086	0.1267	3.2251	0.3410
AGE	-0.0257	0.0116	2.2079	-0.2410

Constant = 0.8416
Multiple Correlation = 0.3994
Percentage Goodness of Fit = 15.9561
No more Variables found to be Significant.

APPENDIX N (continued)

Means and Standard Deviations of Scores for Each of the Three Dimensions of Dogmatism by Sample

	The Dimensions of Dogmatism (as measured by the Dogmatism Scale E)					
	The Belief-Disbelief Dimension		The Central-Peripheral Dimension		The Time-Perspective Dimension	
	M	SD	M	SD	M	SD
MAIN FAMILIAR SAMPLE (n=80)	20.65	3.519	155.7	20.21	18.33	4.757
ENGLISH SAMPLE (n=80)	16.621	4.342	113.67	24.28	12.78	4.729
't' between MAIN FAMILIAR ENGLISH SAMPLES	6.496 (P<.001)		11.986 (P<.001)		7.449 (P<.001)	

(NOTE: the 't' value for a two-tailed test is 3.291, at the .001 level, for df = ∞)

APPENDIX N (continued)

Matrix of the Product-Moment Correlations between Each of the Second-Level Factors of Attitude to Curriculum Innovation and Each of the Three Different Dimensions of Dogmatism for the ENGLISH SAMPLE (n=82)

The Second-Level Factors of Attitude to Curriculum Innovation	The Dimensions of Dogmatism (Q20)		
	The Belief-Disbelief Dimension (Q20A)	The Central-Peripheral Dimension (Q20B)	The Time-Perspective Dimension (Q20C)
EF'_A	-.097	-.233*	-.154
EF'_B	-.275*	-.317**	-.123

* Significant at the five per cent level ($P_{.05}$ = .217, df = 80)

** Significant at the one per cent level ($P_{.01}$ = .283, df = 80)

NOTE: a. The Dogmatism Scale E was labelled Q12 in India and Q20 in England.

b. See Appendix J for corresponding results in India.

APPENDIX N (Continued)

Means and Standard Deviations of Scores for each Item in the Dogmatism Scale E by Sample

Dogmatism Scale E Item Numbers	Samples				Significance of the difference between the means for MAIN FAMILIAR SAMPLE and the ENGLISH SAMPLE	
	MAIN FAMILIAR SAMPLE (n=80)		ENGLISH SAMPLE (n=82)			
	Mean	SD	Mean	SD	t	P
1	3.98	2.00	3.31	1.80	2.26	.05
2	5.50	1.69	4.11	1.86	4.98	.001
3	5.87	1.34	4.39	1.86	5.69	.001
4	5.29	1.47	4.91	1.79	1.46	ns
5.	3.67	2.27	3.64	2.11	0.10	ns
6	2.90	1.87	3.33	1.87	3.91	.001
7	4.62	1.89	3.57	1.88	3.56	.001
8	4.82	1.98	2.97	1.76	6.27	.001
9	5.12	1.58	3.92	1.85	4.43	.001
10	5.20	1.65	5.24	1.71	0.15	ns
11	3.98	1.87	3.43	1.69	1.99	.05
12	4.08	1.98	3.43	1.59	2.33	.05
13	3.17	1.69	2.86	1.57	1.21	ns
14	5.51	1.75	3.33	1.87	7.65	.001
15	5.06	1.84	3.04	2.00	6.69	.001
16	6.26	0.86	3.61	1.86	11.68	.001
17	5.81	1.14	4.99	1.57	3.80	.001
18	5.41	1.47	4.70	2.03	2.55	.05
19	4.52	1.80	3.24	1.81	4.51	.001
20	5.65	1.36	2.94	1.81	11.20	.001
21	6.23	0.95	3.69	1.95	10.67	.001
22	4.01	1.97	2.40	1.68	5.57	.001
23	4.75	1.60	3.53	1.85	4.49	.001
24	4.82	1.69	3.14	1.61	6.49	.001
25	4.16	2.02	2.77	1.72	4.71	.001
26	4.17	2.10	3.86	1.89	1.00	ns
27	5.12	1.85	3.22	1.84	6.55	.001
28	4.82	1.49	3.16	1.48	7.12	.001
29	4.93	1.91	3.39	1.74	5.40	.001
30	5.61	1.58	2.55	1.48	12.70	.001
31	5.05	1.79	4.11	1.89	3.24	.01
32	5.21	1.54	3.28	1.63	7.72	.001
33	5.00	1.75	3.07	1.62	7.26	.001
34	4.93	1.78	3.91	1.82	3.64	.001
35	5.73	1.26	5.40	1.26	1.72	ns
36	5.31	1.59	3.96	1.84	5.00	.001
37	4.47	1.74	2.49	1.53	7.71	.001
38	4.48	1.60	3.41	1.90	3.88	.001
39	4.53	1.82	3.41	1.76	4.01	.001
40	4.73	1.86	3.21	1.66	5.50	.001

APPENDIX N (continued)

Frequency distributions of scores for Neuroticism, Extraversion and Rigidity respectively in the ENGLISH SAMPLE (n = 82)

(i) Frequency distribution of Neuroticism (Q21N) scores

Neuroticism Scores	Frequency distribution of scores
0 - 3	9
4 - 7	18
8 - 11	21
12 - 15	23
16 - 19	7
20 - 23	4

(ii) Frequency distribution of Extraversion (Q21E) scores

Extraversion Scores	Frequency distribution of scores
2 - 4	5
5 - 7	14
8 - 10	24
11 - 13	20
14 - 16	15
17 - 19	4

(iii) Frequency distribution of Rigidity (Q22) scores

Rigidity Scores	Frequency distribution of scores
41 - 49	4
50 - 58	16
59 - 67	27
68 - 76	26
77 - 85	8
86 - 94	1

Principal Components matrix for the PERSONALITY variables from their intercorrelations in the ENGLISH SAMPLE

(NOTE: The sample size for the Principal Components analysis was 90 (see text))

Variables	COMMON FACTOR LOADINGS (unrotated)			
	I	II	III	IV
Dogmatism	-.856	.163	.198	.448
Rigidity	-.806	-.149	.425	-.384
Neuroticism	-.609	.468	-.620	-.159
Extraversion	.356	.852	.377	-.065
Latent Roots	1.880	0.994	0.747	0.378
% Common Variance	47.01	24.85	18.67	9.46

APPENDIX N (continued)

The Zero-Order Correlations in the ENGLISH SAMPLE (n=82) between the RESISTIVITY FACTORS and the other Variables

The Other Variables	The Zero-Order Correlations	
	RF_1	RF_2
Age	-.019	-.326**
Sex (Male/Female)	.185	-.022
Academic Qualifications (Graduate/Non-Graduate)	-.001	.091
Professional Training (Trained/Untrained)	-.118	.012
Teaching Experience (Less than/More than 10 years)	.110	-.402**
Type of School (State/Private)	-.076	-.248*
FAMILIARITY (Quite Unfamiliar/Familiar)	.149	-.057
Experience of Bureaucracy	-.369**	.072

NOTE: a. For the categorical variables, the scoring was 1 for the first alternative and 2 for the second alternative.

b. The correlations given here for Teaching Experience and FAMILIARITY (the artificial dichotomies) were obtained after correction.

c. * Significant at the 5 per cent level.
** Significant at the 1 per cent level.

APPENDIX O

The results for the rejected items and the discarded factors

APPENDIX C

THE RESULTS FOR THE FIRST-LEVEL FACTORS THAT WERE DISCARDED FROM THE SUBSEQUENT ANALYSES (THAT IS, THE RESULTS FOR FACTORS I:V(8C), I:V(9A), I:V(9B))

The salient items for factor I:V(8C)

Item Number in Section Q8	Statement	Factor Loading	Direction of Scoring
13	The weakness of the course materials is that they only deal in general with the principles of engineering drawing.	-.567	normal
2	The course materials enable students to develop a good understanding of the basic principles of engineering.	.472	reverse
15	Students are not getting sufficient guidance from their teachers to learn properly from the course materials used.	-.470	normal
8	The course materials make students discuss a lot with the teacher.	.458	reverse

Note: for the direction of scoring see Chapter 4

The reliability (alpha coefficient) for the first-level factor I:V(8C)

	Item number in Section Q8			
	13	2	15	8
13	-			
2	.225	-		
15	.332	.203	-	
8	.203	.175	.043	-

(Note: $\bar{r}$ = .197; alpha coefficient = .49)

The Results of the ITEM ANALYSIS for Section Q9

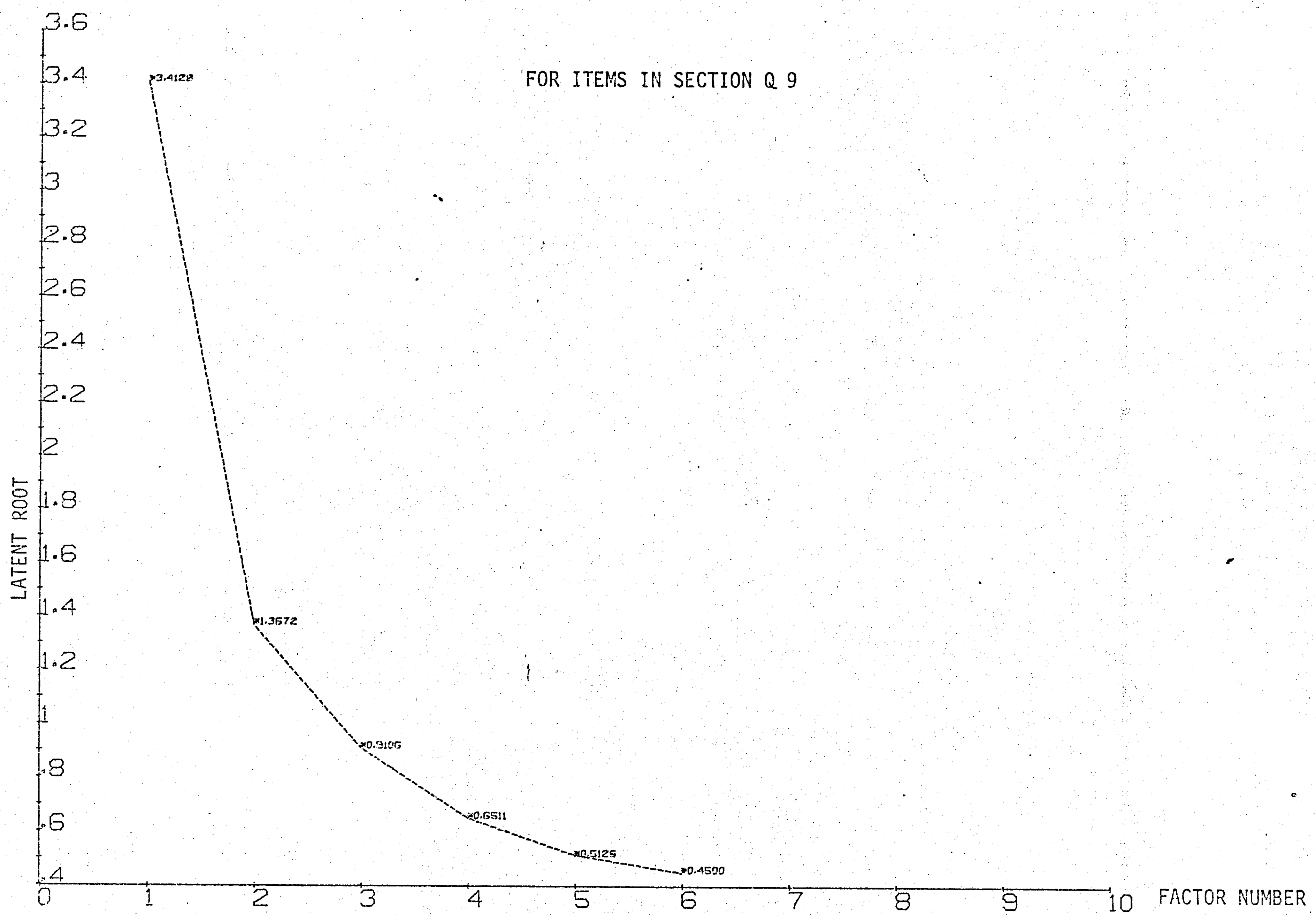
The product-moment inter-item correlations for Section Q9 were as shown.

	Item Number in Section Q9							
	1	2	3	4	5	6	7	8
1	-							
2	.317	-						
3	.194	.584	-					
4	.428	.538	.549	-				
5	.410	.257	.279	.376	-			
6	.237	.230	.104	.274	.298	-		
7	.182	.526	.423	.321	.073	.297	-	
8	.509	.260	.285	.443	.542	.374	-	-

Principal Components Matrix for Q9 items (from the inter-item correlations in the MAIN FAMILIAR SAMPLE (n = 80)

The Variables (Q9 items)	Common Factor Loadings (unrotated)				h^2 (%)
	I	II	III	IV	
1	-.630	.381	-.127	.615	93.6
2	-.729	-.445	-.048	.064	73.6
3	-.676	-.444	-.304	-.278	82.4
4	-.781	-.085	-.213	-.024	66.3
5	-.618	.487	-.159	-.346	76.4
6	-.501	.232	.755	-.184	90.9
7	-.555	-.540	.397	.189	79.3
8	-.688	.486	-.019	-.037	71.1
Latent Roots	3.4128	1.3672	0.9106	0.6511	
% Common Variance	42.66	17.091	11.384	8.139	

GRAPH OF LATENT ROOTS AGAINST FACTOR NUMBER



Varimax Analysis of the items of Section Q9 for the MAIN FAMILIAR SAMPLE (n = 80)

Item Number	Rotated Factor Loadings I	II	III	Communality h^2 (%)
1	-.185	.718	.091	55.8
2	-.822	.181	.153	73.2
3	-.831	.211	-.107	74.5
4	-.633	.511	.030	66.2
5	-.107	.793	.062	64.0
6	-.043	.306	.883	87.3
7	-.690	-.113	.518	75.7
8	-.131	.804	.216	71.0
Percentage Variance	28.8	27.9	14.1	

According to Kaiser's criterion, two factors would have been extracted. However, the "scree test" seemed to favour a three-factor solution. Certainly, Factor III explained a substantial portion of the common variance. In the event, we decided for a three-factor solution. However, it was not possible to construct a reliable composite variable from the items which defined Factor III and therefore this third factor was abandoned.

The defining items for I:V(9A) (Belief in the innovativeness of the teachers' support materials)

Item Number in Section Q9	Statement	Factor Loading	Direction of Scoring
3	The materials include teacher analysis sheets	-0.831	reverse
2	The materials provide details of lesson plans	-0.822	reverse
7	The materials state quite clearly what the objectives of each topic are	-0.690	reverse
4	The materials give information about the required depth of treatment for the topics	-0.633	reverse

The defining items for I:V(9B) (Belief in the innovativeness of the students' support materials)

Item Number in Section Q9	Statement	Factor Loading	Direction of Scoring
8	The materials include graded exercises for students in every topic	0.804	reverse
5	The materials provide test questions	0.793	reverse
1	A wide range of engineering problems are included in the materials	0.718	reverse

Note:- (a) The composite variables which were derived from these items were designated respectively as (f_5) and (f_6).

(b) For the direction of scoring see Chapter 4.

The Results for the Composite Variables (f_5) and (f_6) (representing the first-level factors I:V(9A) and I:V(9B), respectively) in the MAIN FAMILIAR SAMPLE (n = 80)

(i) The alpha coefficients for (f_5) and (f_6) were .79 and .74 respectively as calculated from the inter-item correlations shown below.

The inter-item correlations for the composite variable (f_5)

	Item Number in Section Q9			
	3	2	7	4
3	-			
2	.584	-		
7	.423	.526	-	
4	.549	.538	.321	-

(Note: $\bar{r}$ = .49; alpha coefficient = .79)

The inter-item correlations for the composite variable (f_6)

	Item Number in Section Q9		
	8	5	1
8	-		
5	.542	-	
1	.509	.410	-

(Note: $\bar{r}$ = .487; alpha coefficient = .74)

(ii) The frequency distributions were highly skewed showing that both the teachers' support materials and the students' support materials were definitely seen by the teachers as innovative!

I:V(9A)(f_5) scores	Frequency distribution of scores
7 - 10	1
11 - 14	2
15 - 18	2
19 - 22	17
23 - 26	38
27 - 30	20

I:V(9B)(f_6) scores	Frequency distribution of scores
3 - 5	1
6 - 8	1
9 - 11	5
12 - 14	5
15 - 17	21
18 - 20	37
21 - 23	10

APPENDIX O (Continued)

MATRIX OF THE PRODUCT MOMENT INTER-ITEM CORRELATIONS OF THE REJECTED ITEMS (FOR THE MAIN FAMILIAR SAMPLE (n = 80))

	The Questionnaire Items																						
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
A	-																						
B	.311	-																					
C	.079	.261	-																				
D	.145	.332	.096	-																			
E	.034	.093	-.152	-.102	-																		
F	.056	.174	.126	.382	-.102	-																	
G	-.066	.054	-.033	.015	.065	-.212	-																
H	-.095	-.210	-.057	-.099	.243	-.050	-.049	-															
I	.155	.098	.144	.176	.023	.203	-.210	-.000	-														
J	.037	-.089	-.046	.061	.054	-.005	-.023	.111	-.097	-													
K	.005	.021	.139	.043	-.117	.052	-.090	-.017	.067	.119	-												
L	.096	-.137	.266	-.124	-.103	-.110	.064	-.166	.021	.117	.135	-											
M	-.005	-.265	.079	-.083	-.072	-.009	-.286	.254	.063	.173	.126	.086	-										
N	.113	-.018	-.156	-.026	-.041	-.027	.043	.051	-.091	.165	.100	.012	.151	-									
O	.097	-.097	-.025	.021	-.156	-.031	.041	.024	.032	.163	.159	.096	.069	.382	-								
P	-.118	.059	.002	.062	-.091	.096	-.056	.043	.077	-.059	-.033	.035	.062	-.033	-.051	-							
Q	.108	.181	-.231	.131	.021	.102	-.060	-.158	.055	.175	-.189	-.184	-.012	.307	.108	.075	-						
R	-.099	-.394	.015	.002	.022	.111	-.075	.248	-.101	.220	.144	-.106	.239	.112	-.013	.024	-.113	-					
S	-.145	-.023	.080	-.043	.059	-.009	-.010	-.254	.065	-.136	-.014	.117	-.044	.030	.082	.015	-.081	.052	-				
T	-.070	.060	-.039	-.042	.220	-.156	-.052	-.128	.133	.023	-.054	-.017	-.080	-.058	.015	-.180	.004	-.110	.069	-			
U	.100	.023	.092	.008	.280	-.056	.001	-.055	.130	-.014	.096	-.021	-.111	.011	.052	-.106	-.031	.017	-.022	.463	-		
V	-.065	.017	.069	.092	.063	.047	.013	.099	-.028	-.023	.005	-.147	.065	-.138	.039	.023	-.085	.019	.022	.030	.131	-	
W	.155	.129	-.019	.163	.151	.028	.205	-.136	-.098	.050	.120	-.137	-.106	.025	.160	-.092	.050	.040	-.161	.142	.234	-.024	-

Note: (a) The REJECTED ITEMS were those which were left out after the factor analy ses of the inter-item correlations of questionnaires Q7, Q8 and Q10 (see Chapter 4).

(b) The items were as follows (with the questionnaire item numbers in bracke ts)

Q7 items: A(Q7.7), B(Q7.8), T(Q7.1), U(Q7.2), V(Q7.13), W(Q7.15)
Q8 items: C(Q8.2), D(Q8.6), E(Q8.8), F(Q8.11), G(Q8.12), H(Q8.13), I(Q 8.14), J(Q8.15)
Q10 items: K(Q10.1), L(Q10.4), M(Q10.5), N(Q10.15), O(Q10.19), P(Q10.23), Q(Q10.28), R(Q10.29), S(Q10.30)

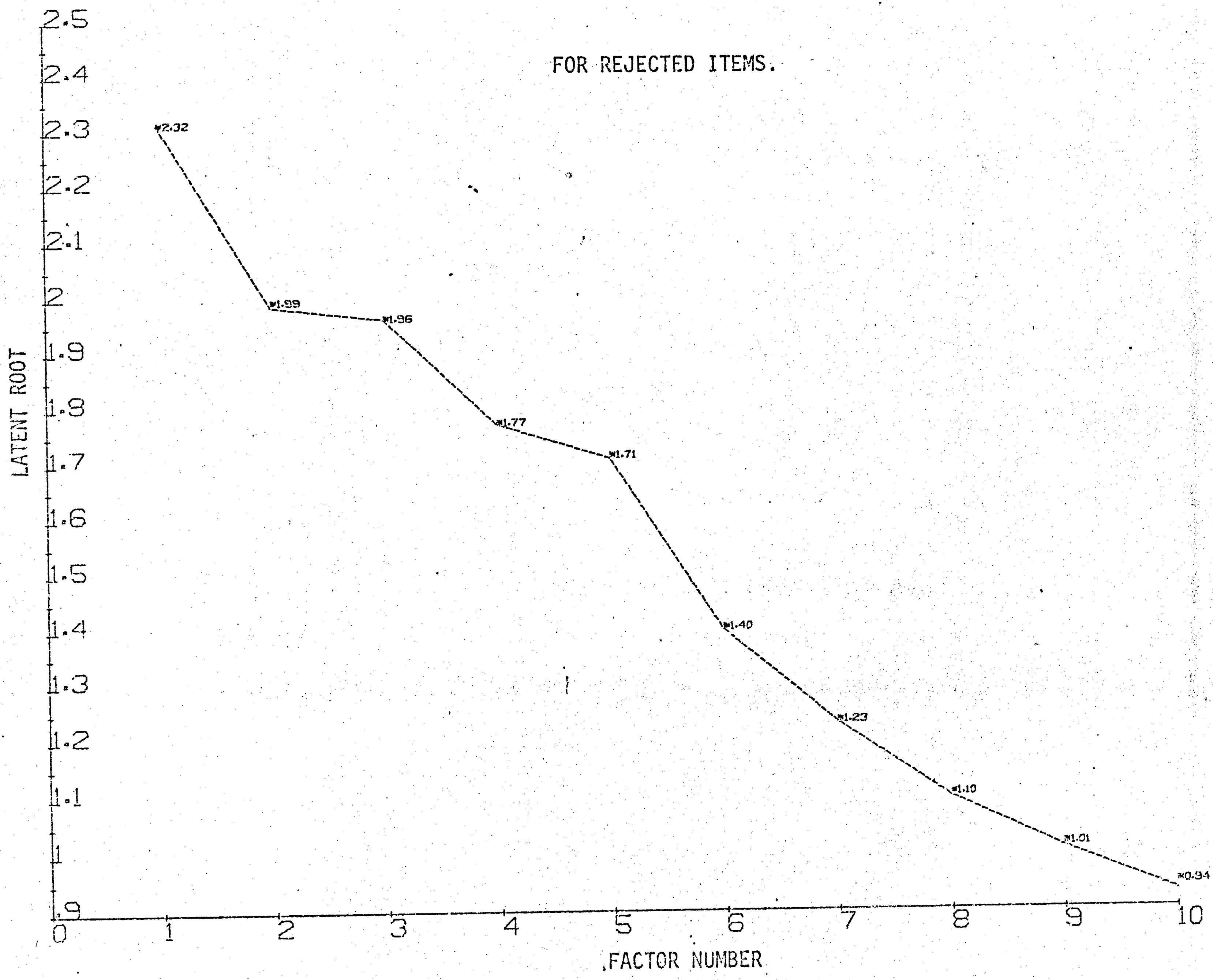
PRINCIPAL COMPONENTS MATRIX FOR THE REJECTED ITEMS FROM THE INTER-ITEM CORRELATIONS

(NOTE: Only the principal components with latent roots greater than 1 are given here)

Variables (The Rejected Items)	Common Factor Loadings (unrotated)								
	I	II	III	IV	V	VI	VII	VIII	IX
A	.419	-.161	.298	.038	.105	.022	-.514	.083	.070
B	.764	-.088	-.001	-.054	-.099	.115	-.115	.203	.196
C	.227	-.221	-.204	.569	.218	.211	-.105	.141	.197
D	.495	-.407	.168	.017	-.174	.216	.193	-.242	.086
E	.037	.526	.230	.068	-.359	-.530	-.141	-.107	.541
F	.287	-.551	.041	.154	-.301	.069	.261	-.180	.043
G	.072	.246	-.029	-.315	.244	.482	.113	.123	.286
H	-.514	-.029	.161	.095	-.420	.158	-.329	.172	.257
I	.307	-.230	.033	.407	-.144	-.430	-.133	.017	.062
J	-.223	-.154	.489	-.034	.117	.083	-.151	-.272	.182
K	-.068	-.228	.219	.415	.312	.244	.102	-.000	-.158
L	-.028	-.026	-.195	.215	.686	-.041	-.278	-.141	.200
M	-.454	-.267	.289	.316	-.127	-.166	-.106	.184	-.101
N	-.143	-.197	.550	-.313	.307	-.201	.060	.167	.181
O	-.066	-.145	.476	-.048	.458	-.088	.193	.370	-.002
P	-.032	-.320	-.192	-.078	-.222	-.073	.177	.269	.171
Q	.247	-.183	.389	-.516	-.133	-.369	.042	.018	.002
R	-.522	-.190	.250	.217	-.144	.208	.269	-.341	.183
S	.014	.058	-.242	.141	.270	-.384	.533	-.031	.458
T	.224	.565	.234	.284	-.009	-.348	.116	-.160	-.158
U	.197	.444	.431	.482	-.052	-.101	.083	.037	-.075
V	-.061	.145	-.000	.252	-.255	.150	.242	.608	.002
W	.308	.247	.479	.009	.021	.461	.210	-.040	-.155
Latent Roots	2.317	1.987	1.964	1.772	1.710	1.400	1.232	1.099	1.008
% Common Variance	10.07	8.64	8.54	7.70	7.43	6.09	5.36	4.78	4.38

GRAPH OF LATENT ROOTS AGAINST FACTOR NUMBERS

FOR REJECTED ITEMS.



VARIMAX ANALYSIS OF THE REJECTED ITEMS

Variables	Rotated Factor Loadings I	II	III	Communality h^2 %
A	0.284	-0.314	0.335	29.1
B	0.663	0.383	0.078	59.2
C	0.145	-0.293	-0.189	14.3
D	0.272	-0.570	0.202	44.0
E	0.213	0.468	0.258	33.1
F	0.042	-0.620	0.047	38.8
G	0.206	0.290	-0.005	12.6
H	-0.500	0.176	0.103	29.2
I	0.186	-0.333	0.056	14.9
J	-0.323	-0.054	0.454	31.4
K	-0.178	-0.183	0.200	10.5
L	-0.013	-0.013	-0.199	4.0
M	-0.554	-0.067	0.225	36.2
N	-0.273	-0.125	0.522	36.3
O	-0.174	-0.108	0.459	25.2
P	-0.132	-0.282	-0.210	14.1
Q	0.107	-0.266	0.405	24.6
R	-0.581	0.031	0.183	37.1
S	0.065	0.048	-0.237	6.3
T	0.398	0.431	0.284	42.5
U	0.303	0.331	0.471	42.3
V	0.000	0.158	-0.000	2.5
W	0.321	0.105	0.521	38.6
% Variance	9.8	8.9	8.6	

(Note: Only three factors were rotated on the basis of the scree test)

ALPHA CO-EFFICIENTS FOR THE THREE FACTORS FROM THE INTERCORRELATIONS OF THE SALIENT ITEMS (i.e. ITEMS WITH FACTOR LOADINGS GREATER THAN 0.4)

(a) Alpha co-efficient for Factor I

Inter-Item Correlation Matrix

	Salient Items for Factor I			
	B	H	M	R
B	-			
H	.210	-		
M	.265	.254	-	
R	.394	.248	.239	-

$\bar{r} = .268$

$\alpha = .59$

(b) Alpha co-efficient for Factor II

Inter-Item Correlation Matrix

	Salient Items for Factor II			
	D	E	F	T
D	-			
E	.102	-		
F	.382	.102	-	
T	.042	.220	.156	-

$\bar{r} = .167$

$\alpha = .44$

Alpha Co-efficient for Factor III

Inter-Item Correlation Matrix

	Salient Items for Factor III					
	J	N	O	Q	U	W
J	-					
N	.165	-				
O	.163	.382	-			
Q	.175	.307	.108	-		
U	-.014	.011	.052	-.031	-	
W	.050	.026	.160	.050	.284	-

$\bar{r}$ = .126

α = .46

APPENDIX P

OBJECTIVE UNCERTAINTY ABOUT CURRICULUM INNOVATION (as proposed)

We have discussed subjective uncertainty in the text and consequently in this appendix we only examine the concept of objective UNCERTAINTY as applied to teachers' perceptions of curriculum innovation.

Simply put, objective UNCERTAINTY was the minimal number of questions that a potential receiver of information in a communication system had to raise in order to identify any signal or symbol being transmitted from a source. Objective UNCERTAINTY (H) was calculated from the formula:

$$H = -\sum_{i=1}^{n} P_i \log_2 P_i,$$

where (P_i) was the probability of occurrence of a symbol (i) and (n) was the number of symbols.

In this formulation, UNCERTAINTY arose by virtue of the freedom of choice on the part of the sender of a signal; variations in the signals depended essentially on him. However, UNCERTAINTY could also arise becuase of so-called "noise", that is, because of interference with the transmission of the signal in its passage to the receiver.

The use of the concept of objective UNCERTAINTY in the present study was legitimised by the application of Information Theory in experimental psychology. Attneave (1959) has described how a subject in experimental psychology might be shown various stimuli of a particular class and be required to identify each stimulus. In effect, the subject in this experimental situation was much like the receiver in a communication system (Garner, 1962); he was in the position where he had to respond to the stimulus-signal by categorising it. The data collected from this kind of experiment might be conveniently arranged in a matrix in which the columns indicated the values of the stimulus-signals and the rows the discrete values of the response variable. Each cell in the matrix then gave the frequency of responses for a particular stimulus-signal and a particular response category. An estimate of the UNCERTAINTY of response could then be computed. Thus, in the diagram below,

		Stimulus-signal values (X)					
		1	2	----------------	i	-----------	X
Response Categories (Y)	1 2 3 ⋮ j ⋮ Y						

if X_1, X_2 .... were alternative stimulus-signal values for X

Y_1, Y_2 .... were discrete categories of the response variable Y

n_{ij} was the frequency of responses for stimulus (i) and response category (j).

then: $$H_Y = - \sum_{j=1}^{j=Y} P_j \log_2 P_j$$

In the following calculation, we used the concept of objective UNCERTAINTY simply in order to establish the degree in which it might be said to exist about curriculum innovation. It was assumed that an individual who completed a structured questionnaire (about curriculum innovation) by responding to a number of stimulus statements was in a situation analogous to a receiver in a communication system or to a subject in experimental psychology who responded to a number of stimulus-signals. The respondents to a structured questionnaire had the task of responding to a particular stimulus-statement or item by classifying it in terms of a given range of response categories. Given the frequency distribution of responses to that stimulus-statement or item from a representative sample of respondents, it was possible to work out the objective UNCERTAINTY of response for that particular statement or item as we did overleaf.

The data was from Hotyat (1967); 1,357 teachers indicated the degree of efficiency they attributed to four methods of innovation as follows:

(Methods on which innovation was based)	Perceived effectiveness of the methods of innovation — Response Categories: Very Effective %	Average Effectiveness %	Little Effectiveness %
Practical suggestions by colleagues	76.0	19.4	4.6
New Methodological Principles	15.1	53.6	31.3
Results of Research	32.4	47.3	20.3
Revision of Objectives	50.6	34.6	15.8

For the item "Results of Research"

$$(H) = -\frac{1}{.30103}\left\{(.324\ \log_{10}.324)+(.473\ \log_{10}.473)+(.203\ \log_{10}.203)\right\}\text{ bits}$$

$$= \frac{1}{.30103}\left\{1-(.324\ \log_{10}3.24+.473\ \log_{10}4.73+.203\ \log_{10}2.03)\right\}\text{ bits}$$

$$= \frac{1}{.30103}\left\{1-(.546)\right\}\text{ bits}$$

$$= 1.508\text{ bits}$$

Maximum UNCERTAINTY = $\log_2 3$ bits (if the three possible response categories were equally likely)

Therefore, RELATIVE UNCERTAINTY (%) $= \dfrac{\text{Actual UNCERTAINTY}}{\text{Maximum UNCERTAINTY}} \times 100$

$$= \frac{1.508\text{ bits}}{1.585\text{ bits}}$$

$$= 95.14\%$$

Similarly, for the item "Practical suggestions by colleagues", RELATIVE UNCERTAINTY = 60.9%

∴ the Ratio of RELATIVE UNCERTAINTY for "Results of Research" to "Practical Suggestions by colleagues"

$$= \frac{95.14\%}{60.9\%} = \frac{3}{2} \text{ approximately}$$

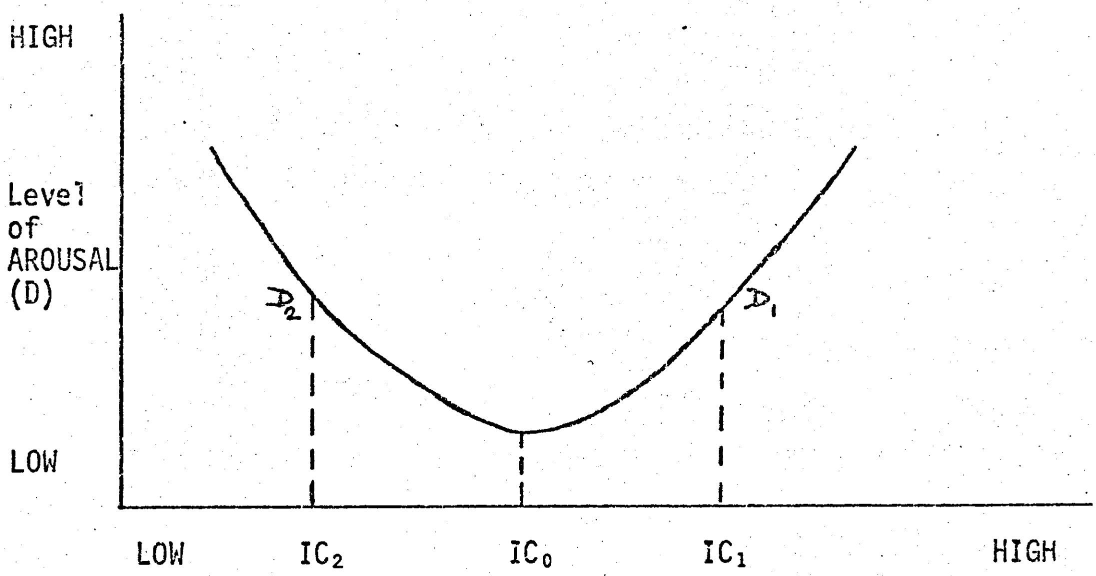
APPENDIX Q

THE EFFECTS OF DOGMATISM, INCONGRUITY AND FAMILIARITY ON THE HEDONIC VALUE OF CURRICULUM INNOVATION (as proposed)

Figure I below shows the curve suggested by Hunt (1963) for the theoretical relationship between "incongruity" and level of arousal. Figure II shows our proposition concerning the joint effects of Dogmatism and "incongruity" on the hedonic value of a particular stimulation.

FIGURE I

<u>The Theoretical Relationship between Incongruity and Arousal</u>



"Arousal potential" OR "Incongruity" (IC)

IC_0 = Optimum level of incongruity

D_1 = Level of arousal for a particular level of incongruity $IC_1(>IC_0)$

D_2 = Level of arousal for a particular level of incongruity $IC_2(<IC_0)$

FIGURE II

THE JOINT EFFECTS OF INCONGRUITY AND DOGMATISM ON AROUSAL

(a) Cross-Classification of the Effects by Incongruity and Dogmatism

		LEVEL OF INCONGRUITY	
		Superoptimal ($>IC_0$) (CASE A)	Supraoptimal ($<IC_0$) (CASE B)
LEVEL OF DOGMATISM	High	Cell (a) effects.	Cell (b) effects
	Low	Cell (c) effects	Cell (d) effects

(These effects are described below).

(b) Description of the Effects in the Cells

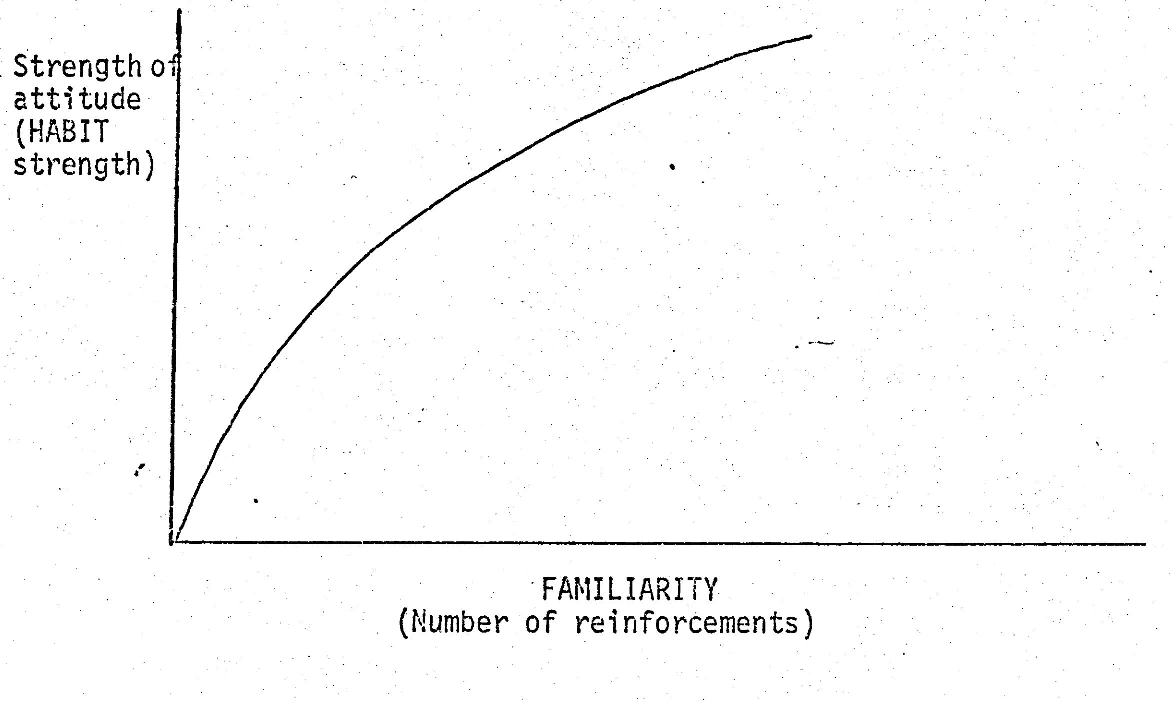
	EFFECTS IN CELLS (a, b, c, d) DUE TO INCONGRUITY AND DOGMATISM	
CELL	Effect on the level of arousal	Effect on the hedonic value of the stimulation
a	Little reduction in arousal	Little gain in positive value
b	Little reduction in arousal	Little gain in positive value
c	Large reduction in arousal	Large gain in positive value
d	Large reduction in arousal	Large gain in positive value

Taking Case (A) first, that is, when "incongruity" was superoptimal, ($>IC_0$), the immediate effect of a high level of dogmatism on an individual (Cell a) was to insulate him from change and to maintain arousal more or less at level D_1, the level prior to the momentary orientation reaction. In the absence of drive reduction, there was no rewarding experience and consequently little seeking after the stimulation, little receptivity and almost no pleasant feelings about it; as Long and Ziller (1965) have said, "the dogmatic person is closed to information". However, for less dogmatic individuals, "incongruity" was reduced through increasing contact, that is, FAMILIARITY, with the new information (Cell c). This reduction in "incongruity" to the optimum (IC_0) was accompanied by a drop in the level of arousal, a return to the optimum level and this was reinforcing. Hence, the stimulation acquired positive hedonic value.

In Case (B) when the level of "incongruity" was supraoptimal, ($<IC_0$) high dogmatics (Cell b) again actively insulated themselves from (that is, avoided FAMILIARITY with) new information which was likely to expose them to more "incongruity". Again, therefore, arousal remained more or less at the level prior to the orientation reaction, say D_2, so that the stimulation got little attention. Low dogmatics, on the other hand (Cell d) were motivated to seek after stimulation. The "incongruity" inherent in the new information induced "epistemic curiosity" (Berlyne, 1960) which in turn exposed open-minded individuals to even more of the incongruity in the stimulation. Such exposure was accompanied by a lowering of arousal (a reduction in drive) which was reinforcing. Open-minded individuals tended, therefore, to be drawn increasingly towards the stimulation and to develop positive feelings towards it.

The curve showing the learning or development of attitudes towards curriculum innovation with increasing FAMILIARITY (with curriculum innovation) was assumed to be like typical learning curves (see Figure III). In these curves, HABIT strength increased as a function of the number of reinforcements of stimulus response bonds. In a similar way it was proposed that attitudes towards curriculum innovation developed as a function of FAMILIARITY with it.

FIGURE III



Catastrophic changes in teachers' attitudes to curriculum innovation (as proposed)

(THESE NOTES ARE ONLY MEANT TO COMPLEMENT OUR BRIEF REFERENCE TO CATASTROPHE THEORY IN THE TEXT)

We posited that HABIT and NOVELTY/CURIOSITY were in the terminology of Catastrophe Theory "normal" factors, that is, the frequency distributions for HABIT and for "epistemic CURIOSITY" in the teaching population were unimodal. However, these two factors were also "conflicting factors" (Chidley, 1976) and the conflict that arose between them caused a "split" in attitudes within the teaching population. The term HABIT stood here for learned response patterns and was at once the equivalent of "mental sets", of stimulus-response bonds, and of associations which were part of TOTE units. (see Chapter 2)

Below was our proposed model for the effect of the two conflicting factors (HABIT and NOVELTY/CURIOSITY) on teachers' attitudes to curriculum innovation. For the sake of clarity, we examined only the "cusp catastrophe" (Figure 1).

A particular point on the "control space" with co-ordinates (H, N/C) gave rise to a definite amount of conflict. Each such point determined a particular distribution of attitudes to curriculum innovation in the teaching population. These distributions were not drawn here but each point on the graph G (the ATTITUDE SURFACE) represented the particular attitude which had the maximum probability of occurrence; that is, it was the attitude with the maximum frequency in the population.

G had a peculiar form. In the middle of G there were two sheets representing attitudes and these two sheets were connected by a third sheet giving a continuous pleated surface. This pleat became narrower towards O and disappeared eventually at X. The variation in the teachers' ATTITUDES with degrees of conflict might be studied by supposing that degrees of conflict were plotted on the CONTROL SPACE. The bottom sheet of the ATTITUDE SURFACE was then the graph of negative attitudes that had maximal probability of occurrence for particular values of conflict and HABIT. The assumption was that there was a tendency for strong HABITS to be associated with negative attitudes to innovation. In other words, HABIT would tend to push attitudes to innovation on to the bottom sheet. Similarly, CURIOSITY was associated with positive attitudes to innovation and would tend to push attitudes to innovation on to the top sheet.

G was smooth for degrees of conflict less than O' X' but split for degrees of conflict greater than O' X'. Figure 2 represented section of G transverse to OX for a degree of conflict greater than O' X'.

It showed that in the region where the graph was double sheeted there were two possible attitudes, A_1 and A_3, with maximum probability of occurrence for a particular point on the CONTROL space. In other words, in that region conflict caused bimodality; it split the population into two groups: one group with a NEGATIVE attitude to innovation (A_1) and the other group with a POSITIVE attitude (A_3). A_2 represented the least likely attitude.

FIGURE 1

(The Cusp Catastrophe)

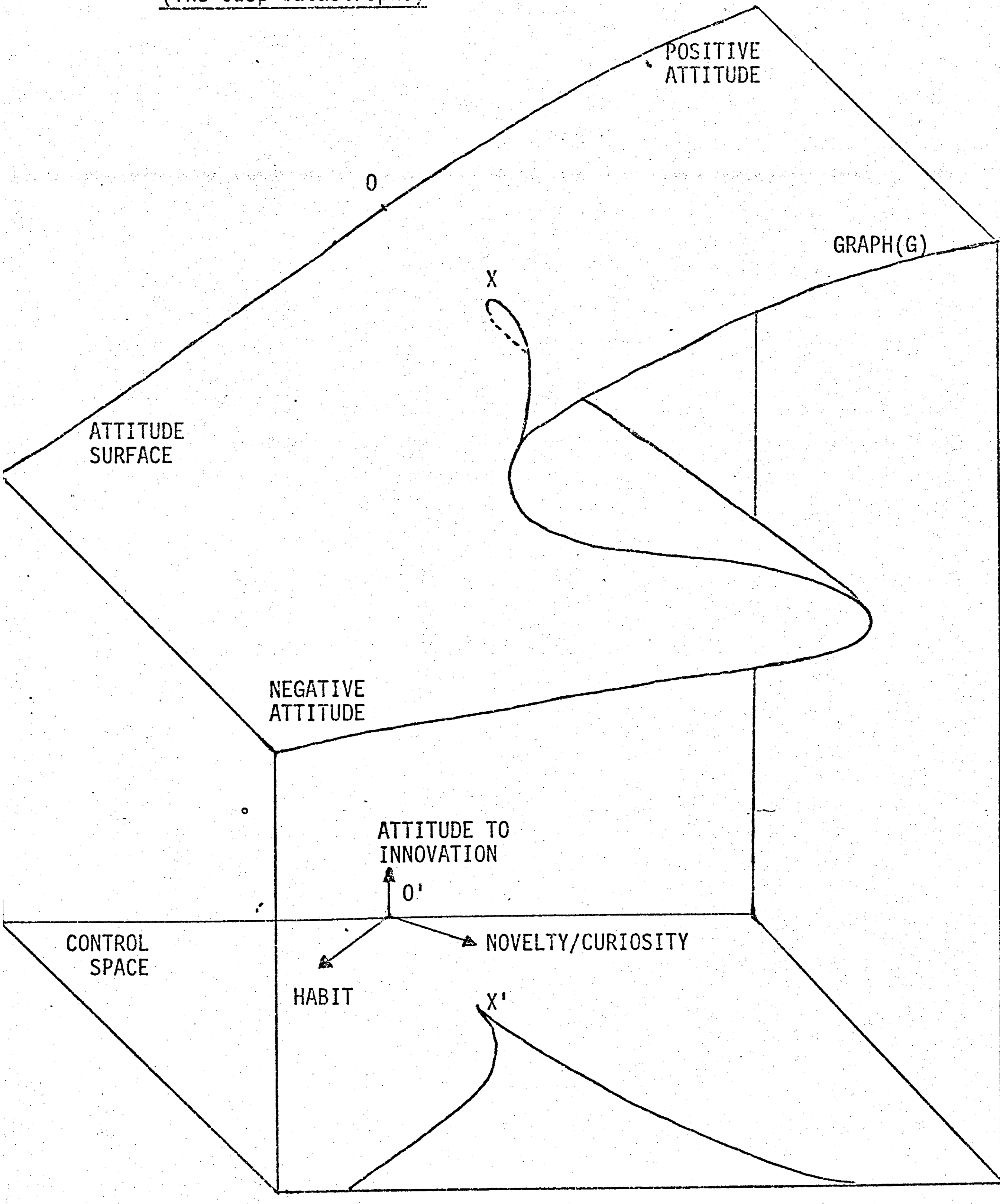
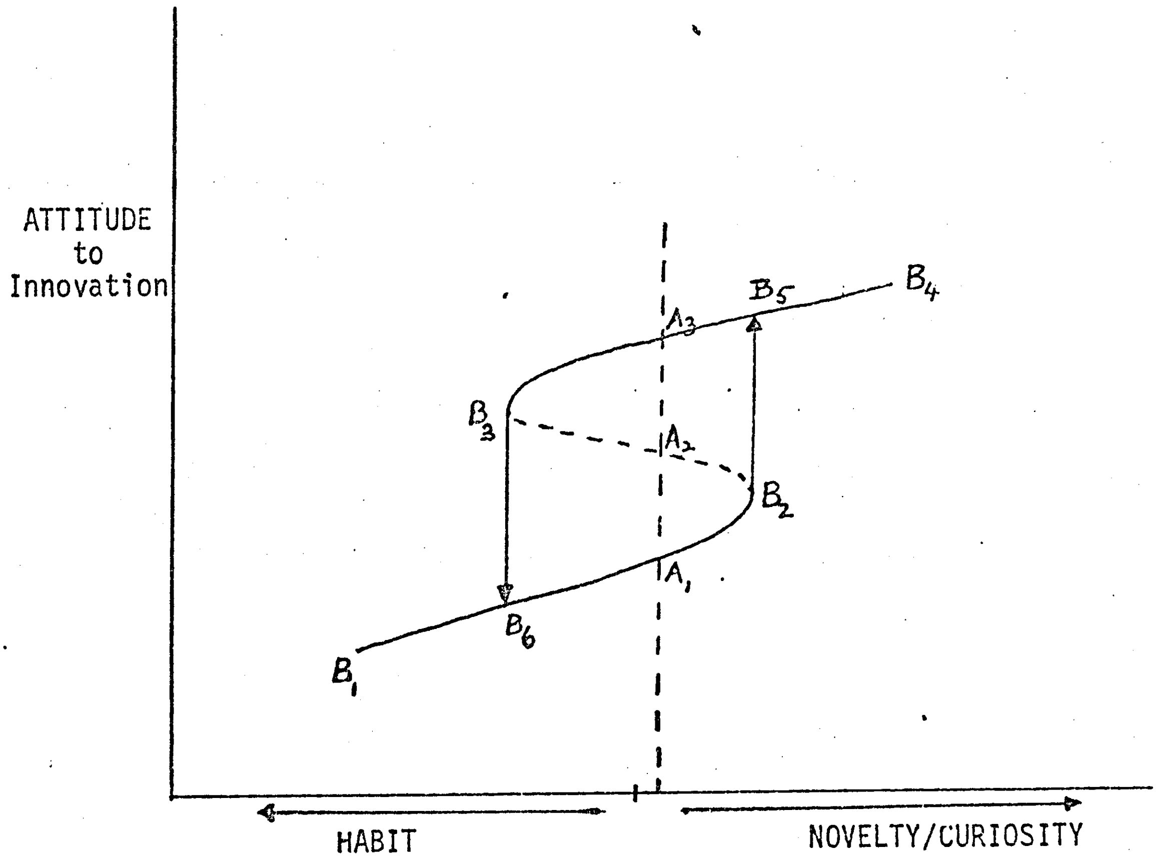


FIGURE 2

Graph of Attitude to Innovation for a High Degree of Conflict



Now, if we assumed that the "Delay Rule" was appropriate in the context of curriculum innovations as in most applications of Catastrophe theory to the Social Sciences (Isnard, 1976), we could trace the likely paths on G for changes in majority attitudes arising from variations in HABIT and CURIOSITY. Thus, if we let B_1 represent a majority attitude resulting from strong HABIT and little CURIOSITY, then with lower values for HABIT and higher values for CURIOSITY, the attitude of the majority changed to B_2. The change was smooth and followed the path shown from B_1 to B_2 along the graph of NEGATIVE ATTITUDES. However, at B_2 there was a sudden change, a "catastrophe" to B_5 on to the POSITIVE ATTITUDE graph as indicated by the arrow ($B_2 \rightarrow B_5$). Similarly, the change in attitude that accompanied diminishing values of CURIOSITY was smooth and followed the path B_5 to B_3. However, at B_3 there was a sudden change to the NEGATIVE ATTITUDE graph at B_6. Thus, on the basis of Catastrophe Theory we postulated the existence of threshold points where small changes in HABIT and NOVELTY/CURIOSITY respectively, resulted in large, significant changes in attitudes to curriculum innovation. Although we have considered paths traced by majority attitudes, the same ideas could be developed at the micro level for an individual teacher but it was evident that there could be considerable variations across individual teachers.